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CONSIDERATION OF ENVIRONMENTAL FACTORS IN TRANSPORTATION SYSTEMS PLANNING

FINAL REPORT

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EXECUTIVE SUMMARY

INTRODUCTION

This report presents a broadly applicable approach for integrating environmental factors in systems-level transportation planning and decision making. The approach was developed based on a comprehensive assessment of state and metropolitan level practices for addressing the environment in transportation planning. To facilitate the implementation of research findings, the approach is compatible with existing planning techniques, procedures, and institutional arrangements. However, the approach is flexible enough to take advantage of changes in planning regulations, institutional relationships, and emerging technologies that will help make transportation agencies better stewards of the environment.

A conceptual framework of the transportation system planning and project development process is used to show where environmental factors could be incorporated to improve this process. This conceptual framework is shown in the figure on the following page. As shown, environmental considerations can be included in many of the steps that normally constitute system planning and project development.

RESEARCH OBJECTIVE AND APPROACH

The objective of this research was to develop an approach, including procedures and methods, for integrating environmental factors in transportation systems planning and decision-making at the statewide, regional and metropolitan levels. The research consisted of the following tasks:

1. A review of recent and ongoing research and literature on the consideration of environmental factors in transportation and other infrastructure systems planning, highlighting innovative procedures and methods and reporting on their effectiveness in improving transportation decision-making.
2. A survey of procedures and methods, used in state Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) and environmental regulatory agencies, for consideration of environmental implications of systems level plans and decisions.
3. A review of federal and state policies, regulations and guidelines that can be expected to affect the consideration of environmental factors in transportation system planning and decision-making.
4. A set of case studies of state and metropolitan planning processes to synthesize current and successful procedures, methods and institutional arrangements for integrating environmental concerns into transportation planning.

5. The development of a planning process that provides a broadly applicable framework for assessing, evaluating and integrating environmental concerns within transportation systems plans and decisions.
6. An application of the framework to demonstrate its potential effectiveness and show how it can be used to identify opportunities and challenges for enhancing environmental stewardship through transportation planning.

What are the benefits of considering environmental factors in transportation systems planning?

- Transportation agencies can avoid or at least minimize environmental impacts as they relate to network investment decisions.
- Projects that jointly meet both transportation purposes and enhancement of environmental quality can be more easily identified
- Identifying sensitive environmental areas or regions can provide an important context for much broader community development planning
- Environmental sensitivities as they relate to project characteristics can be carried through all steps of the planning process thus resulting in better projects, or at least better mitigation strategies
- Needs and purpose justification required in project development can be provided earlier in the process
- When combined with interagency partnerships, considering environmental factors in system planning can expedite environmental resource agency reviews in project planning
- Although more staff time is often spent in the early stages of planning, this is more than offset with staff time savings later in project development

MAJOR FINDINGS

This research has examined many different examples of how state DOTs and MPOs have considered environmental factors in transportation system planning. In several cases, transportation agency officials are actively involved in comprehensive efforts to more effectively integrate concern for the environment, community development, and infrastructure provision. However, in most instances, this research found that transportation agencies are more concerned with what happens during project development (with respect to environmental impacts) than with developing more environmentally sensitive plans. Considering environmental factors in system planning requires a comprehensive examination of not only the planning process, but also of how an organization has structured its interaction with environmental resource agencies and

Several important findings from this research are as follows:

- The scientific literature is increasingly identifying a **systems-level perspective** on environmental impact determination as being the most appropriate.
- States having **strong environmental laws**, not surprisingly, have undertaken more efforts to consider environmental factors in transportation systems planning.
- State and MPO officials expect to see more attention being given to the types of environmental impacts that are **best addressed at a systems level**.
- A small number of states and metropolitan areas have taken major steps in **integrating environmental factors into transportation systems planning**.
- The importance to decision making of including environmental factors in systems planning very much depends on the degree to which impacts can be **defined at a level that allows an understanding of consequences.**
- The availability of **powerful database management capabilities** has spurred more intensive efforts to identify sensitive environmental resources.
- The concept of assessing the level of environmental sensitivity of habitats, ecosystems and watersheds has been used by several planning and transportation agencies as a **starting point for more comprehensive community planning**.
- Some planning efforts are defining **transportation plan alternatives** that focus on minimizing environmental impacts
- Successful consideration of environmental factors in system planning will require **substantive public involvement and participation of environmental stakeholders**.
- By conducting environmental assessments earlier in systems planning, **project development has been made more effective**.
- State DOTs are implementing other changes to agency operations to **expedite projects through the project development process**.
- A **context sensitive solutions (CSS) approach** to project development is viewed by state DOTs and MPOs as a "win-win" situation.

INSTITUTIONAL STRATEGIES TO IMPLEMENT CHANGE

Each of the successful efforts identified in this research of incorporating environmental factors into the policy, planning or project development activities of a transportation agency was implemented with strategic deliberation and consideration of how such a change could be best carried out in the organization. Although each of the case studies presented different aspects of incorporating environmental factors into organizational procedures or agency culture, the strategies usually had many common characteristics. These characteristics included:

Top Management Support: Every example of successfully incorporating environmental considerations into systems planning examined in this research had either an elected official or a top agency official as its champion. Enabling the interagency partnerships that

construed as approval of a project long before some of the specific impacts are known. State transportation agencies that have successfully formed partnerships with their respective resource agencies have done so by promising to consider seriously the likely impact of transportation projects on the environmental factor at issue, and often supporting environmental staff review.

FUTURE RESEARCH

In many ways, this research project suggests a rethinking of the way systems planning is conducted in the U.S. At the very least, it suggests a different mindset among the majority of transportation planners and engineers of how environmental factors should be considered during the planning process. It also focuses attention on the types of environmental issues that will likely be faced in the future, and thus the types of expertise that will be necessary if these issues are to be dealt with in a serious way. The following proposed research topics are designed to get the transportation profession to this point.

Understanding the systems effects of ecosystems, human development, and transportation investment: Scientists have been focusing on ecosystem health for many decades and are just now beginning to understand many of the complexities that characterize ecosystem health. Some attention has been given to the negative impacts of human activity on ecosystems, although most of this research has been at the macro level (e.g., number of wetlands and thus wetland functionality lost). Very little attention has been given to the relationship between ecosystem health and transportation investment. Such research would examine the basic science involved with this relationship and develop methods and tools that can be used to investigate ways of reducing the influence of transportation-induced disruptions. This research would have to be truly multi-disciplinary to bring the scientists that are knowledgeable about ecosystems together with engineers and planners who understand the construction and operational characteristics of transportation system performance.

Understanding the political, social and land use contexts for transportation planning, and how they affect the opportunities for and constraints on considering environmental factors during systems planning: This research has identified several cases where initial steps have been taken to integrate community planning, infrastructure provision and environmental assessment. In many cases, these planning activities have evolved in separate institutional constructs, and it is only through the intervention of community activists, political leadership, or legislative mandate that such integration has been attempted. Research is needed to better understand the different social and political contexts that foster such coordinated planning, and those that serve as a hindrance.

Developing tools for integrated environmental/transportation systems planning: Although the survey of MPO officials indicated that the inadequacy of analysis tools for addressing environmental problems at the systems level was not considered a serious constraint, it is likely that these officials did not have in mind the integrated concept proposed in this research. It is very clear from this research that one of the prerequisites for getting mutually beneficial participation from the environmental and transportation communities in systems planning is to have an analysis capability that provides important indications of potential problems. This was shown in Florida to be one of the key determinants for environmental resource agency participation. Although GIS capabilities are important points of departure for identifying sensitive environmental areas, additional

CHAPTER ONE

INTRODUCTION AND RESEARCH APPROACH

INTRODUCTION

Understanding the environmental consequences of transportation investment decisions has been a concern of transportation decision makers for many decades. Although many transportation plans prior to 1970 examined in a cursory way the likely community and environmental impacts of proposed system investment, it was not until the 1969 National Environmental Policy Act (NEPA) and its application to all types of federally-funded projects that environmental analysis and assessment became an important component of transportation planning and project development. Initially, the major impact of NEPA occurred in the project development process where environmental assessments or environmental impact statements were conducted to determine the significance of potential environmental impacts and to identify strategies to mitigate these impacts. Given a growing societal awareness of environmental quality, and as well as a response to a multitude of federal and state laws concerning the consideration of a variety of environmental impacts, state and metropolitan transportation plans began to include "environmental impact" as an important part of the evaluation process. Other studies, such as alternatives analysis, major investment studies and corridor studies, also examined the likely environmental impacts of proposed transportation alternatives. However, the identification of project-specific environmental problems or so-called "fatal flaws" usually did not occur until a project had entered the project development stage, usually many years after the project had first been considered in the planning process.

National experience has shown that, in many cases, waiting until the project development stage of transportation decision making to deal with environmental issues that might have been resolved earlier in the process (for example, during systems planning) can result in significant delays in project completion. In addition, the tasks of identifying, defining, and prioritizing projects that occur in the transportation planning and programming process might have had different (and better) results if more information on likely impacts had been available during this early consideration. An important question thus becomes, is there some way of considering environmental issues earlier in systems planning that will not only help to reduce project development time later on, but will also lead to better projects?

This report presents an approach for integrating environmental factors in systems-level transportation decision making, at the statewide, regional and metropolitan levels. The approach was developed based on a comprehensive assessment of state and metropolitan level practices for addressing the environment in transportation planning. To facilitate the implementation of research findings, the approach is compatible with existing planning techniques, procedures, and institutional arrangements. However, the approach is flexible enough to take advantage of changes in planning regulations, institutional relationships, and emerging technologies that will help make transportation agencies better stewards of the environment.

Individual environmental impact categories have also been broadening their definition of affected areas and thus the boundaries of analysis.

Some environmental impacts because of their very nature have been viewed from a systems or regional perspective. A good example of this is air quality, which has received considerable attention with regard to the regional application of processes and tools. Other impact categories have been evolving along similar lines. Water quality and water resource planning, for example, have been expanding the boundaries of analysis to include entire watersheds. Wildlife and natural habitat analysis now encompasses entire ecosystems. Environmental justice considerations are being viewed as more than neighborhood-specific impacts; programmatic effects on entire populations are part of the analysis. Effective environmental assessment of specific environmental impacts thus requires a much broader analysis perspective, and a strong linkage to systems-level planning.

Consideration of environmental factors in transportation system planning must be more than a glorified "fatal flaw" analysis.

Historically, environmental factors have been incorporated into planning and project development decisions as potential problems that need to be identified and mitigated. This is primarily due to the engineering approach of reducing the scale of analysis to such a level that the "environment" was simply a consequence of facility development. The real challenge, and one that is likely to characterize infrastructure decision making even more in the future, is how can the environment be enhanced by infrastructure decisions, rather than how we mitigate negative environmental impacts? How do we build with the natural environment instead of through it? How do we make sure infrastructure investments improve the quality of life of all groups of society? In such a concept, transportation agencies become stewards of environmental resources, and engineering decisions become important means of enhancing the environment.

Transportation systems planning is an important input into the investment and operations decisions that strongly influence transportation system performance.

Linking environmental considerations to transportation systems planning begs the question of what is transportation systems planning? The process of systems planning consists of many steps, all of which can be viewed as potential opportunities for integrating environmental considerations. As will be discussed later in this report, systems planning ranges from the initial definition of a community vision to the actual monitoring of the performance of the projects that have been implemented. The view adopted in this research is that the primary purpose of systems planning is to provide the information necessary and needed by decision makers to make decisions regarding investment in the transportation system. This information not only relates to expected changes in transportation system performance resulting from that investment, but also to other types of impacts on the natural and human environment that can be expected. In a society that is increasingly sensitive to environmental quality and community quality of life, this means that this information must include an understanding of environmental consequences.

The evolution of agency relationships and the resulting organizational mindsets have created significant institutional barriers to promoting a closer integration of environmental factors and transportation planning

In most cases, concern for environmental quality rests with agencies and organizations whose major mission is to minimize harm to the natural and man-made environment. The history of transportation and environmental agency interaction in project development efforts has often included strong conflict over the intent and substance of environmental regulations. Even within state transportation agencies, environmental units are often at odds with the more traditional highway engineering groups with respect to the level of consideration that should be given to environmental factors in project development. Any process or effort to better link environmental factors to the system planning process will most likely have to consider how institutional barriers to such an effort can be surmounted.

ORGANIZATION OF THE REPORT

The remainder of this report is organized as follows. Chapter 2 discusses the evolutionary context and key characteristics of environmental stewardship in transportation planning. This was done by examining important bodies of literature, identifying ongoing research on similar topics, and reviewing federal and state legislation, policies and regulations as they relate to how environmental considerations have or are supposed to be considered in systems planning. Special attention was given to literature outside of the U.S., in particular from Europe, where incorporating environmental considerations earlier in decision making has been developed to a much greater extent than has occurred in the U.S. Appendix A presents guidelines on strategic environmental assessments that are undertaken in Europe. Appendix B lists many of the state laws and policies that influence how transportation agencies approach environmental assessment.

Chapter 2 also reports on the results of a national survey of state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and state environmental agencies. This survey was an important point of departure for this research in that it provided a snapshot in time of how states and metropolitan areas are viewing environmental factors in the context of transportation systems planning. In addition, the results of the survey were used to identify potential case studies of where the linkage between the environment and transportation investment was considered effectively in systems planning. The survey instruments used for this research are found in appendix C.

Chapter 3 presents a conceptual framework that shows how environmental factors can be integrated more seriously throughout the transportation systems planning and project development process. In particular, this framework suggests where such factors can be considered early in the process, and the strategies for doing so that came from the case studies. Because the systems planning process is defined very differently for state-level transportation planning versus metropolitan-level planning, the chapter presents the results of the research that are targeted at both implementation environments. Case studies of both state and metropolitan transportation planning and decision making are used to illustrate how current best practice at integrating environmental considerations into transportation systems planning relates to the conceptual framework.

Chapter 4 discusses emerging analysis methods and tools for integrating environmental considerations into transportation systems planning. This chapter takes

CHAPTER TWO

CONTEXT AND CURRENT STATE OF THE PRACTICE

INTRODUCTION

The past 30 years represent an important era in environmental policy. Federal and state laws were passed to provide a more serious and comprehensive consideration of environmental factors in decisions that would clearly affect the natural and man-made environment. Advances in science and technology allowed us to understand the often tenuous nature of the relationship between the natural and built environments. Science and technology also showed great promise in helping reduce the negative environmental impacts of human activity, the best transportation example likely being the improvements in motor vehicle engine technology that have continually lowered the tailpipe emissions of new automobiles over time. However, even as such progress is being made, scientists warn about the significance of the continuing loss of habitat, of diversity in these habitats, a declining availability and quality of water, the increasing human consumption of non-renewable natural resources, and the loss of "community" associated with modern urban form.

Chapter 2 provides a context for the research results presented in the remaining portions of this report. This research project reviewed many different bodies of literature associated with linking environmental considerations and transportation planning. This literature is summarized in the first section of this chapter. In particular, the research team wanted to obtain a better idea of what other countries are doing with transportation and environmental planning. Special attention was given to the European Union, which has taken more active steps than the U.S. in fostering a closer linkage. Appendix A provides a more extensive coverage of the European Union approach toward environmental assessment.

The legislative and regulatory requirements for better linking environmental considerations and transportation planning and decision making are an important starting point for any discussion of what needs to be done and why. The second section of this chapter discusses laws, policies and regulations that provide a legislative framework for environmental stewardship in transportation planning. Appendix B provides an extensive list of state laws that refer to some linkage between transportation and environmental analysis.

Finally, an important beginning point for any research is an understanding of the current state-of-the-practice. This research conducted a national survey of state DOTs, metropolitan planning organizations (MPOs), and state environmental agencies to determine both what is currently being done to consider environmental factors in transportation system planning, but also to obtain from transportation and environmental professionals what they think the key issues will be in the future. The third section of this chapter reports on the results of these surveys.

The concept of carrying capacity is linked very closely to the viability of ecosystems. The carrying capacity of an ecosystem thus reflects the ability of an ecosystem to be "disturbed" while still carrying out its basic natural functions. As noted by White (*9*), the "ecological footprint" of a city is based on "the pattern of consumption, aggregated into a single measure of the land required to support various activities, such as food and transport requirements, energy use, landfill requirements and so on." Perhaps the best example of this literature is found in Wilson (*10*), which states that "the appropriation of productive land—the ecological footprint—is already too large for the planet to sustain, and it's growing larger." At the global scale, studies of what it takes to support the economic functioning of developed countries have concluded that "we need more than three 'planet Earths' to support the current world population at a level of consumption typically found in rich countries" (*11*).

Figure 1 illustrates the relationship between the human activity and ecosystem stability. This figure shows the changing characteristics of vegetation in Aiken, South Carolina as the city "footprint" expanded over the past 100 years. The change from primarily pine savanna to mixed pine hardwoods in the area surrounding the city is explained mostly by the increasing levels of impervious surface in the region, thus increasing runoff (*12*). This changing dynamic also suggests that considering environmental factors in transportation systems planning necessarily must examine the secondary and indirect effects of such investment on development patterns and magnitudes, and thus eventually on the natural environment.

Figure 1 about here

One of the most important themes in the growing literature on urban environments is the concept of the city as an ecosystem (see, for example, *13*). As noted by Tjallingii (*14*) and expanded upon in Newman and Kenworthy (*15*), "the city is conceived as a dynamic and complex ecosystem. This is not a metaphor, but a concept of a real city. The social, economic, and cultural systems cannot escape the rules of abiotic and biotic nature." Based on this concept, policy and planning principles can be developed to guide both governmental and individual decisions relating to community development and urban design. Basic to this approach, however, is the idea that environmental and community concerns need to be considered early in the community development decision making process.

The concept of "sustainability" is also an important part of the environmental literature, and has been adopted as a "design concept" in fields such as architecture (see, for example, *16, 17)*, city planning (see, for example, *18, 19, 20*), and manufacturing (see, for example, *21, 22*). Sustainable development is now a stated policy objective for many nations (*23*). Sustainability or sustainable development has many meanings. Perhaps the most appropriate definition for this research project comes from Roseland (*24*) in which sustainable development is defined as the "economic and social change to improve human well being while reducing the need for environmental protection." Inherent in this definition is a pro-active approach to progress that considers environmental impacts and social equity issues very early in the community decision making process.

In the last decade, several existing organizations have had their responsibilities expanded and several new organizations have been created to address issues of sustainable development. In the U.S., such agencies included the Environmental Protection Agency, which took on new responsibilities and the Department of Energy, which created the Center for Excellence for Sustainable Development. In addition, a

Context sensitive solutions can be defined as a process in which a transportation project is developed from the very beginning in a collaborative process that involves many different stakeholders, each of whom has different perspectives on what the project should be and how it might impact the surrounding natural and community environment. As noted in a recent NCHRP report, "CSD recognizes that a highway or road itself, by the way it is integrated within the community, can have far-reaching impacts (positive and negative) beyond its traffic or transportation function. The term CSD refers to as much an approach or process as it does to an actual outcome" (*30*).

One of the seminal events in CSD/CSS as it has evolved in the transportation field occurred in 1998 when a Maryland State Highway Administration-sponsored national workshop entitled *Thinking Beyond the Pavement* promoted a non-traditional approach to highway design (*31*). The participant-defined vision for this new design process included (as reported in *30*):

A vision for excellence in transportation design includes these qualities:

- The project satisfies the purpose and needs as agreed to by a full range of stakeholders. This agreement is forged in the earliest phase of the project and amended as warranted as the project develops.
- The project is a safe facility both for the user and the community.
- The project is in harmony with the community and preserves environmental, scenic, aesthetic, historic, and natural resource values of the area.
- The project exceeds the expectations of both designers and stakeholders and achieves a level of excellence in people's minds.
- The project involves efficient and effective use of resources (time, budget, community) of all involved parties.
- The project is designed and built with minimal disruption to the community.
- The project is seen as having added lasting value to the community.

A vision of the process which would yield excellence includes these characteristics:

- Communicate with all stakeholders in a manner that is open honest, early and continuous.
- Tailor the highway development process to the circumstances. Employ a process that examines multiple alternatives and that will result in consensus on approaches.
- Establish a multi-disciplinary team early with disciplines based on the needs of the specific project and include the public.
- Seek to understand the landscape, the community, and valued resources before beginning engineering design.
- Involve a full range of stakeholders with transportation officials in the scoping phase. Clearly define the purposes of the project and forge consensus on the scope before proceeding.
- Tailor the public involvement process to the project. Include informal meetings.

the localized characteristics of some impact categories (such as noise) that might not be available when systems planning occurs.

Although many articles and books have developed "new" approaches to transportation systems planning, very few have specifically examined the role that environmental considerations should play in this process, other than as part of the evaluation process. The European literature, which will be examined in more detail in the following section, has devoted more attention to this issue (see, for example, *34, 35*). But even in this literature, the primary attention given to environmental factors is a discourse of how transportation systems affect the natural and built environment, with a recommendation that such issues should be more closely linked. Very little attention has been given to how such linkages should occur and what techniques could be used in analysis and evaluation.

One of the most recent books on transportation systems planning begins the process of thinking about how such connections should be accomplished (*36*). This book views transportation as one system that relates to, and is part of, many other systems. This perspective leads to important planning questions reflecting the interaction among transportation and other systems that help an urban area function, as well as between transportation and higher level systems, such as ecological or economic systems. In particular, transportation system impacts on the ecosystem are highlighted as an important emerging issue in transportation planning. The linkages between the construction, operation, and maintenance of transportation facilities and the natural environment must often be considered from the broader perspective of the spatial and temporal linkages that characterize such processes.

This book also examines the difference between what was referred to as a "traditional planning process" and one that is concerned with sustainability. Table 2 shows the key differences between the two. Some of the key differences that are relevant to this research are the importance of ecology and systems theory for understanding the scale of impacts; the focus of the technical analysis on the relationship between the transportation system and ecosystems, land use, economic development, and social health; the use of societal costs to assess the value of environmental assets that are degraded or lost due to system development; and the importance of issues relating to biodiversity and economic development.

Table 2 about here

As noted by the authors, the characteristics of a sustainable development-oriented planning process will clearly evolve to reflect new understandings of the relationships between the human and natural environments. However, the significance of the planning process characteristics shown in Table 2 lies in the idea that those who practice a more traditional approach to transportation planning have a very different mindset than those interested in viewing the transportation planning process more broadly. The basic scientific foundation for the two approaches is different, thus leading to the use of tools and techniques for analyzing environmental impacts that vary significantly. The types of strategies that result from both planning processes and the type of information that is produced to inform such decisions will also be very different.

influence in SEA application. In addition to the benefits of early detection and mitigation of environmental effects, SEA was found to provide a more efficient approach to both policy development and implementation. The report also identified some obstacles in the successful implementation of SEAs, such as lack of expertise and lack of institutional collaboration.

Another recent EC publication on transport SEAs is *SEA of Transport Corridors: Lessons Learned Comparing the Methods of Five Member States* (*39*). This study analyzed five SEAs of multi-modal transport corridors, and found that an SEA can be more effective if initiated at the earliest stages of planning. The report demonstrates that SEA is feasible for transport corridor assessment, and that flexibility is important for adoption. It concludes that SEA is vital in the effort to promote multi-modal approaches and to optimize the combination of infrastructure and non-infrastructure solutions.

From a legislative perspective, the EC has adopted COM 511 (41), the Council Directive on the assessment of plans and programs on the environment. In 1999, this Directive was further defined to extend existing, project-level environmental assessment approaches to the planning and programming level (*42*). The Council Directive requires early consideration of environmental impacts in decision-making, which, in essence, is SEA. The Directive pertains to a range of public plans and programs in areas such as transport, energy, waste, water, industry, tourism, telecommunications, town and country planning and land-use. The European Commission's *Case Studies in Strategic Environmental Assessment* (*43*) provides an overview of the status of SEA legislation in the EU Member States and includes three case studies in which SEA principles were integrated into existing decision-making procedures at the strategic level.

In broader work on SEA, a 2001 report by the EC (*44*) examines the benefits, challenges, and methods for integrating environment factors into decisions concerning plans, policies, and programs. A collection of SEAs is studied in Partidário and Clark (*45*), with a focus on the use of SEA to promote sustainability. Therivel and Partidário (*46*) analyze the strengths and challenges of SEA, and detail case studies of SEA from around the world. Partidário (*47*) reviews practical approaches for SEA efforts and identifies key issues raised by practitioners. And Therivel (*48*) examines several existing and then-emerging SEA systems in European countries.

Numerous guidebooks have been developed that outline the principles, processes, and methods that could be tailored to different applications (*49*). A large portion of SEA literature provides useful guiding principles and frameworks for the application of SEAs, along with specific methodologies. A report by the EC (*50*) provides detailed guidance and methods for SEA for transport infrastructure plans. This report examines principles and processes of SEA, such as levels of planning (network, corridor, project), steps to conduct an SEA, and methods of impact assessment for the transport sector. An earlier publication by the EC (*51*) set out methods to incorporate environmental issues into the definition and preparation of regional plans and programming documents in the context of the EU's Structural Funds process.

The key factors identified for successful SEA in all of these guidance materials include the following:

- **Legislative Support**: The most successful SEA generally occurs where there is a legal obligation to require it.
- **Transparency**: SEA needs to be a transparent process that allows environmental considerations to be highlighted.

- In Canada, Transport Canada[1] is involved in the development of performance measures for systems level decision-making. In response to a legislative requirement, Transport Canada outlined its Sustainable Development Strategy in 1997, setting the direction for integrating environmental concerns with safety and efficiency in developing policies and programs and carrying out its day-to-day operations (*55*). Two years later, Transport Canada adopted a Sustainable Development Action Plan (SDAP), which outlined eight sustainability challenges that articulate the agency's sustainable development goals. In partnership with other agencies and various stakeholders, Transport Canada is presently involved in developing performance measures, collecting data and developing analysis tools to monitor and advance its progress toward sustainability (*56*).
- Baltic 21 is a multi-country process of regional cooperation and environmental improvement involving countries bordering the Baltic Sea. The effort focuses on seven sectors of crucial importance in the region: agriculture, energy, fisheries, forestry, industry, tourism, and transportation. Sustainable transportation indicators have been developed as part of the monitoring effort toward meeting the objectives of sustainability set out in the Baltic 21 agreement. The proposed set of indicators is based on outcome-oriented indicators linked to specific goals.
- In June 1999, the New Zealand Ministry of the Environment published *Proposals for Indicators of the Environmental Effects of Transport*. The main purpose of the document was to provide the basis for agreement on the use of a core set of indicators to measure the environmental effects of transportation decisions. The Proposal identified the following factors as major components of a framework for performance assessment: root causes of transport activity; indirect pressures; direct pressures, and state or effects indicators.
- The OECD has developed a framework of indicators for integrating environmental concerns into transportation policies. The OECD model has been adopted as the most appropriate way to structure environmental information by most members of the European Union and by a number of international organizations that deal with environmental information. Details on the OECD model are presented in the Appendix A. Table 4 lists the sustainability indicators related to transportation policies.

Table 4 about here

- In 1996, the City of San Francisco developed a sustainability plan with transportation as one of the 15 major elements given priority. The City has identified seven major transportation and land use goals and developed a set of four transportation indicators to monitor progress toward these goals. An extensive community consultation process, which involved some 400 volunteers, was used in developing the plan. The plan formulation was dependent on work done for the European Union's *Agenda 21 Implementation plan*.
- The Department of the Environment, Transport and Regions of the United Kingdom (UK) has developed indicators of sustainable development grouped

[1] As well as several other organizations, e.g., Environment Canada, National Round Table of the Environment and the Economy, Ontario Round Table on Environment and Economy, Transportation Association of Canada and Victoria Policy Institute.

- Management Review – Assessing the suitability, adequacy and effectiveness of EMS over time and addressing needed changes to all elements of system.

For transportation agencies, an EMS would relate closely to the activities undertaken in planning, programming, project development, operations and maintenance for any mode of transportation. In particular, it would most likely interface closely with other management systems that are already in place in many transportation organizations, such as those relating to pavement management, bridge management, congestion management, safety management, maintenance and construction management, and project tracking.

One of the best sources for information concerning the potential application of EMS procedures in transportation agencies is found in (*58*). This report comes from an NCHRP project entitled "Environmental Information Management and Decision Support System". This project was initiated to respond to the need of state transportation agencies and metropolitan planning organizations for systems to manage environmental information and to support decision-making. The project objective was to develop a concept and implementation approach for an Environmental Information Management and Decision Support System (EIM & DSS) that addresses all levels of decision-making – planning programming, project development, operations, and maintenance--for all modes of transportation. Reference *58* is a handbook that describes the EIM & DSS concept and provides guidance to state DOTs and MPOs on developing and implementing such systems.

Interestingly, this NCHRP project concluded from interviews with state DOT officials that an ISO 14001-compliant EMS is not sufficient to meet their decision-making needs. However, the value gained from the ISO 14001 EMS concept was considered to be in its focus on explicitly creating environmental policies, objectives and targets, and measuring the impacts of decisions on these objectives and targets.

SUMMARY OF LITERATURE

The literature presented in the previous sections covers a wide range of topics that suggest the importance of incorporating environmental considerations early in the systems planning process. The basic messages that result from this literature search include the following:

1. Transportation and environmental professionals approach problems in very different ways. The underlying scientific concepts and the resulting analysis methods can lead the problem-solving search in a variety of directions. The meaningful incorporation of environmental considerations into transportation systems planning will require transportation professionals to rethink the relationship between transportation investments and the environment.
2. The "systems" perspective is a key point of departure for examining environmental impacts and understanding the relationships between the construction and operation of the transportation system, ecological systems and the built environment. This perspective encourages agencies to incorporate systemic environmental concerns, such as air quality and watershed impacts, into the transportation planning process.
3. The European literature suggests that other countries are further advanced than the U.S. in integrating environmental concerns into transportation systems

2. Coordinating state planning with "planning needs to be coordinated with "planning conducted by federal, state, and local environmental resource planning that substantially affects transportation actions."
3. Promoting public access and input into the state transportation planning process and for influencing key decisions.
4. Coordinating metropolitan transportation planning with the state implementation plan (SIP) process in non-attainment or maintenance areas; and encouraging the development of transportation control measures.
5. Coordinating NEPA and transportation planning requirements for highway/transit projects among the many different agencies involved with the environmental analysis that occurs during project development.
6. Encouraging environmental steamlining by coordinating the environmental review process for highway construction projects.
7. Executing a planning program to "plan, develop, and implement strategies to integrate transportation and community and system preservation plans and practices that among other things will reduce the impacts of transportation on the environment"
8. Promoting "to the fullest extent possible, all environmental investigations, reviews, and consultations be coordinated as a single process, and compliance with all applicable environmental requirements be reflected in the environmental document required."

These requirements provide an important policy context for environmentally sensitive transportation planning.

The number of federal laws and regulations that could influence transportation planning is quite extensive. However, as noted by the respondents to the surveys, there were some federal laws and Executive Orders (other than ISTEA and TEA-21) that have had a more important impact for considering environmental factors in transportation planning than others. These include:

- *The National Environmental Protection Act (NEPA) of 1969*

  NEPA required the federal, state and local governments to use systematic approaches to incorporate the protection of the natural and human environment within project development processes. NEPA also establishes the national commitment to preserving the environment as a goal of national policy.

- *The Clean Water Act Amendments (CWA) of 1997*

  The CWA of 1997 established the basic structure for regulating the discharge of pollutants into waters of the U.S. Section 404 of the Clean Water Act established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities that are regulated under this program include fills for development and infrastructure development such as highways and airports. The basic premise of the program is that no discharge of dredged or fill material can be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's waters would be significantly degraded.

be in compliance with the law, and in fact the regional planning agency must prepare and certify an environmental document prior to adopting an updated plan. A Program or Master Environmental Impact Report (EIR) is typically prepared for the RTP. An EIR must be prepared if the proposed action will have a significant effect on the environment. In the EIR, consideration of alternatives that would avoid or reduce significant environmental effects is required. A Negative Declaration or Mitigated Negative Declaration may be prepared if no significant environmental impacts are identified, or if all identified potentially significant impacts will be mitigated below the level of significance. The CEQA environmental document must address specific issues, the number and scope of which are determined by the potential environmental impacts.

- *Georgia* – Title 32 (32-2-3) of the Georgia Code requires the Department of Transportation to develop a comprehensive, statewide 20-year transportation plan that must include "the total environment of the community and region including land use, state and regional development goals and decisions, population, travel patterns, ecology, pollution effects, esthetics, safety, and social community values."

- *Maine* -- Maine's *Sensible Transportation Policy Act* (STPA) sets the framework for the Maine Department of Transportation's planning and programming. The STPA resulted from a 1991 citizen-initiated referendum that mandated public participation in transportation decisions. It requires the analysis of alternatives before major highway investments are made.

- *Maryland* -- The *Maryland Smart Growth and Neighborhood Conservation Act* and *Executive Order* became effective in 1997. This initiative directs growth to areas where it is most environmentally suitable while protecting some of the state's most ecologically and environmentally valuable landscapes. It calls for transportation investments that satisfy current and projected travel demands while supporting smarter growth patterns. Maryland's *Transportation Performance Act,* passed in May 2000, requires the Maryland Department of Transportation (MDOT) to apply performance measurements to the Maryland Transportation Plan and the state's Consolidated Transportation Program (CTP) or capital improvement program.

- *Minnesota* -- As per Minnesota State Statutes (Chapter 174.01, Subdivision 2 (1994)), one of Minnesota's 14 transportation goals is "to ensure that the planning and implementation of all modes of transportation are consistent with the environment and energy goals of the state."

- *Oregon* -- Oregon has 19 state planning goals of which transportation is one element. These planning goals include guidance to "protect and enhance the environment, promote energy conservation, and improve quality of life."

- *Pennsylvania* – In January, 1999, the governor issued Executive Order 1999-1 requiring all Commonwealth agencies to identify laws, regulations, practices and policies that advance the Commonwealth's land use objectives. Furthermore, Acts 67 and 68 signed into law in 2000 amended the municipal planning code to allow multi-municipality planning for the first time. All counties are required to have a comprehensive land use plan under the new regulations. State agencies are allowed to consider municipality and county plans and zoning when they make decisions on permitting and funding.

While the low MPO response rate is cause for some concern, these concerns are offset by the fact that almost 300 MPOs were asked to participate in the survey, including those representing very small urban areas. The 45 responses from MPOs did include the largest MPOs in the country, and thus reflect the environmental concerns that would most likely be found in large metropolitan areas. This bias toward large MPOs is not considered a threat to the validity of the research results because large metropolitan areas typically face the widest range of environmental problems. Smaller metropolitan areas encounter environmental issues similar to those faced by larger MPO's, although at a lesser scale. Because of the ability of large MPOs to confront the full range of environmental issues, as well as their ability to draw upon greater resources in addressing these issues, the survey should adequately represent the current state-of-the practice in environmentally sensitive planning. The following sections summarize the results of this survey effort.

KEY FINDINGS FROM THE SURVEYS

Importantly, the survey findings indicate that 38% of the state respondents and a similar percentage of MPO respondents felt that environmental considerations were important (rated 4 or 5 on the survey question) in the development of their latest transportation plan. This percentage increased to 45% for state DOTs and 52% for MPOs when asked how important environmental factors are likely to be in the update of the plan 10 years in the future. Interestingly, the majority of the state respondents felt that environmental factors were somewhat important for both the last update as well as for the future update of the plan. For MPOs, the majority of the respondents fell into the "more important" category.

Generally, there also seemed to be a consensus that incorporating environmental factors earlier in the planning processes leads to better decisions and shortens the time for project implementation. Several DOTs were able to identify specific examples where incorporating environmental factors earlier in planning had resulted in tangible benefits.

The results of the survey are discussed in more detail below. A more detailed summary of the key findings as well as detailed reports for the three surveys are included in Appendix C.

1. **The most considered environmental factors in current transportation planning are air quality, land use, socioeconomic considerations and environmental justice.**

   - The states considered air quality as the most important factor in the most recent plan update as well as likely being the most important factor in the update of the plan ten years hence. MPOs considered land use to be the most important factor both in the most recent plan and in the pending 10-year update of the plan. The environmental resource agencies considered air quality as the most important factor for both states and MPOs, both for the most recent plans and for plan updates ten years in the future.

   - The states identified land use, socioeconomic considerations and environmental justice as the next most important factors in planning in the most recent and 10-year updates of the plan. The MPOs identified air quality, socioeconomic considerations and environmental justice as the next most important environmental factors.

- According to the environmental resource agencies, the most readily available types of data to transportation planning agencies relate to air quality, water quality, erosion, wetlands and stormwater runoff.

6. **The majority of states and a minority of MPOs use performance measures that include environmental factors in transportation planning. Most states and MPOs use performance measures in transportation planning.**

   - Approximately 59% of the responding state DOTs and 36% of the responding MPOs use performance measures that include environmental factors for transportation planning.
   - Approximately 12% of the states and 43% of the MPOs use performance measures that do not include environmental factors

7. **DOTs and MPOs have a relatively high level of interaction with each other and with environmental resource agencies, the Governor's office, environmental advocacy groups and public interest groups in the transportation planning process.**

   - Approximately 46% of state DOTs stated that they interact with MPOs, environmental resource agencies, the Governor's office, environmental advocacy groups and public interest groups (other than environmental) in the transportation planning process. The DOTs interact most closely with MPOs.
   - Approximately 79% of MPOs interact with state DOTs, environmental resource agencies, the Governor's office, environmental advocacy groups and public interest (other than environmental) groups in the transportation planning process. The MPOs interact most closely with the U.S. DOT.
   - Approximately 74% of the environmental resource agencies indicated that they interact with state DOTs, MPOs, other environmental resource agencies, public interest groups (other than environmental) and the Governor's office in the transportation planning process.

8. **Competing priorities that detract from environmental issues and a lack of appropriate planning analysis tools were identified by DOTs, MPOs and environmental resource agencies as the most significant obstacles to considering environmental factors in transportation planning. Lack of data and lack of regulations were perceived as less important obstacles to considering environmental factors in transportation planning.**

   - The highest percentage of DOT respondents (76%) selected "competing priorities that distract from environmental issues" as an obstacle to considering environmental factors in transportation planning; 53% of the DOT respondents indicated that a lack of appropriate planning analysis tools was an obstacle.
   - The majority of MPO respondents (64%) indicated that "competing priorities that distract from environmental issues" as an obstacle to considering environmental factors in transportation planning; 58% of the MPO respondents indicated that the lack of appropriate analysis tools was an obstacle as well.
   - The highest percentage of environmental resource agency respondents (85%) also saw "competing priorities that distract from environmental issues" as an obstacle to considering environmental factors in transportation planning; 38%

Figures 2 to 6 show the differences between the state DOT and MPO respondents for key questions on the survey.

Figures 2 to 6 about here

The survey indicates that there is notable variation in the ways in which different agencies are considering environmental factors in transportation planning. Typically, state DOTs and MPOs place greater emphasis on air quality and environmental justice issues in transportation planning, and use tools as data trend analysis, GIS, air quality impact models, overlay maps and focus groups as part of their analysis. This is not surprising given the emphasis these concerns have received in recent years. Planning agencies generally consider data availability an issue in addressing environmental factors in planning. In addition, they are hindered by the lack of appropriate analysis tools and too many competing objectives that detract from environmental considerations.

Many DOTs and MPOs are including environmental performance measures in planning. Most DOTs and MPOs seem to have taken at least one action to incorporate environmental factors prior to the project development stage. There seems to be general agreement that there is a high level of interaction among implementing agencies, and MPOs seem optimistic that implementing agencies would be supportive of incorporating environmental factors earlier in the planning process. There also seems to be broad consensus that incorporating environmental factors earlier in the planning process generally leads to better decisions. Several agencies gave examples where incorporating environmental factors earlier in planning resulted in tangible benefits.

In general, the survey suggests that state DOTs and MPOs recognize the importance of environmental considerations in transportation planning, but that the state-of-practice is very much oriented toward environmental impact-specific issues. Not surprisingly, air quality and environmental justice were issues pointed to by both state DOT and MPO respondents as those receiving most attention. These are the issues that have been the focus of most recent federal legislation and regulatory actions. Very few examples were found where environmental issues were considered from a systems perspective and linked closely with the development of transportation plans. Some examples were found where agencies, especially state DOTs, have implemented actions to streamline the project development process. Importantly, as seen in the survey response, a major reason for considering environmental factors earlier in the process was considered to be better decisions.

SUMMARY AND IMPLICATIONS OF IMPORTANT FINDINGS

The literature points to several theoretical bases for addressing the environment in transportation planning at a systems level. The idea of cities as ecosystems with finite carrying capacities presents a simple and broadly understood basis for integrating environmental considerations with planning, and for tracking how transportation development decisions are impacting the environment over time. The concept of sustainability is also increasingly important in transportation planning. It refers to economic and social change to improve human well-being while reducing the need for environmental protection.

The importance of legislation in advancing environmental considerations in planning for infrastructure is found in both domestic and international experiences. States that have passed strong environmental legislation, not surprisingly, have made greater

CHAPTER THREE

INCORPORATING ENVIRONMENTAL CONCERNS INTO TRANSPORTATION PLANNING AND PROJECT DEVELOPMENT

INTRODUCTION

This chapter presents a conceptual framework of transportation systems planning and project development that illustrates where environmental considerations can be incorporated into the planning process, and what types of strategies can be used to provide greater sensitivity to environmental concerns. The first section of this chapter describes the conceptual framework. Subsequent sections use the results of the case studies conducted for this project to illustrate how some states and MPOs have incorporated environmental considerations into each step of the system planning and project development process.

An important step in systems planning, and thus a component of the conceptual framework, is the process of analyzing alternatives. This step is heavily dependent on data collection and interpretation. In addition, analysis uses models or other tools to understand how changing the characteristics of the transportation system might affect system performance and otherwise impact the natural and built environment. Because many distinct analysis tools and methods could be used to incorporate environmental factors into systems planning, this topic will be covered in Chapter 4.

The conceptual framework is defined in this chapter in general terms, thus allowing it to describe the basic steps for planning and project development in both statewide and metropolitan-level applications. Clearly, different components of such a framework might receive different levels of emphasis in each type of application. For example, metropolitan transportation systems planning tends to be much more dependent on network modeling activities than most examples of statewide transportation planning. Although several states have developed models that forecast future travel flows on the state's transportation system, most state planning activities have not included this level of complexity in the process.

Another important distinction between metropolitan and statewide transportation planning applications is that a state DOT not only has a responsibility for statewide transportation planning, but also project development. Metropolitan planning organizations (MPOs) are primarily responsible for transportation systems planning; project development is left to other agencies. This is an important institutional issue in that the challenge of influencing systems planning and project development will likely very much relate to which organizations are responsible for each.

defined that monitor whether congestion, average speeds, system reliability and mobility options have changed over time. Very few transportation systems-level examples exist of measures that relate to such things as environmental quality, economic development and quality of life (*61*).

Key to understanding the problems and challenges likely to be faced in the future is the ability to collect and analyze data. The ***analysis*** process primarily focuses on understanding how a transportation system and its components work, and consequently of how changes to that system will alter its performance. Analysis additionally focuses on the relationships between transportation system performance and other topics such as environmental quality, economic development, and quality of life. The analysis step includes the identification of alternative strategies or projects that meet the objectives of the study. Analysis tools, ranging from simple data analysis to more complex simulation models, are used to produce the information that feeds the next step of the process, which is evaluation.

Evaluation is the process of synthesizing the information on the benefits, costs, and impacts generated by analysis so that judgments can be made concerning the relative merits of alternative actions. As noted by Miller and Meyer (*36*), evaluation should have the following characteristics:

- Focus on the decisions being faced by decision makers.
- Relate the consequences of alternatives to goals and objectives.
- Determine how different groups are affected by transportation proposals.
- Be sensitive to the time frame in which project impacts are likely to occur.
- In the case of regional transportation planning, produce information on the likely impacts of alternatives at a level of aggregation that permits varying levels of assessment.
- Analyze the implementation requirements of each alternative.
- Assess the financial feasibility of the actions recommended in the plan.
- Provide information to decision makers on the value of alternatives in a readily understandable form and in a timely fashion.

One of the most common ways of making sure that the results of evaluation are linked closely to the needs of decision makers is through the definition of evaluation criteria that reflect important decision-making concerns. These criteria provide important guidance to planners and engineers on what type of data and analysis tools must be available in order to produce the desired information. The result of the evaluation process is the development of ***recommend strategies*** or of a ***plan***.

In the U.S., the actual program of action, referred to as the transportation improvement program (TIP) for the metropolitan area, and the state transportation improvement program (STIP) for a state, is connected to the plan through a process called ***programming***. Programming is the process of matching the actions that have surfaced through the evaluation process as being the most desirable with the available funds. And when there are insufficient funds to satisfy all of the funding needs, some form of priority setting process occurs. This process can take many forms, ranging from pure politics to the use of systems analysis tools to assign priority weight to different feasible actions.

to assess the consequences of a decision, but also to better understand the definition of the problem, which may require changing this definition based on preliminary analysis results. System monitoring serves as a major source of information on the performance of the transportation system and is thus an important indicator of system deficiencies or opportunities for improvement.

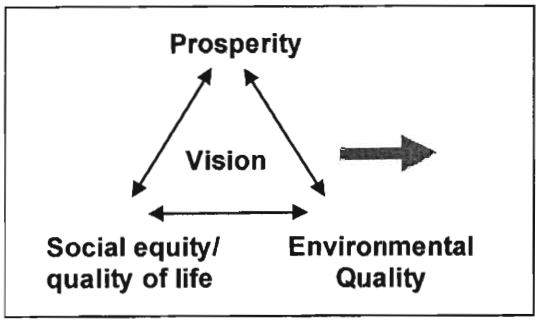
A very important context for the consideration of environmental factors in transportation systems planning is found in the community development decision making process. A community develops in response to a variety of influences, ranging from market and economic factors that affect the location of households and firms to changing levels of accessibility afforded by a transportation system. Land use decisions incorporate a variety of influences, most often reflecting the market demand for community development and the political structure established for making land use decisions. Such decisions can be substantially constrained by both the inability of a transportation system to provide needed levels of accessibility and by environmental limits on the ability to provide water and to support human activity on environmentally sensitive land. Land use decisions drive transportation demand; they can shape the natural environment and alter it in such ways that infrastructure delivery becomes more challenging (e.g., creation of park lands or protected habitats). In addition, land use decisions, such as corridor preservation or transit oriented development, can help create opportunities that support more effective and efficient transportation services.

Historically, transportation projects, and in some cases, plans as well, have been developed with community and environmental issues relegated to an evaluation issue, i.e., how does the proposed project or plan affect land use and environmental characteristics of the adjacent land? And what form of mitigation is necessary? However, the premise of this study is that environmental concerns need to be integrated closely with community planning, and that transportation planning needs to be better integrated with both. By providing a broader context, projects could be identified that provide dual benefits, not only enhancing a community's environmental quality, but also satisfying a transportation need.

Several case studies in this chapter illustrate how some communities have linked community planning, environmental assessment and infrastructure provision. The triangle on the left side of Figure 7 represents this integration. One of the most important challenges to the transportation profession in the next several decades is evolving to a more integrated approach toward community development that both recognizes environmental constraints and that provides infrastructure supportive of the community vision.

The conceptual framework shown in Figure 7 represents a simplification of the systems planning and project development approach to transportation decision making. For this research, the important questions become: 1) To what extent and in what way can environmental factors be incorporated into each of the steps shown in this figure? and 2) Are there steps in systems planning where such factors can be considered earlier such that better and more timely decisions will result? The next sections describe the major components of the conceptual framework, with specific attention given to how environmental factors could and should be considered in each component. Examples of how this can be done are presented from the case studies conducted for this research.

THE ENVIRONMENT... AND VISION



In the context of this research, vision has two meanings. A vision can be a statement of desired end states and/or directions that describe what a community wants to achieve in the future. Or, a vision can be an organizational philosophy or mission statement that outlines an organization's approach to achieving its mandate. With respect to this latter concept of a "vision," state legislation and/or regulation can have an important influence on how an agency incorporates environmental considerations into transportation planning.

An important distinction needs to be made between a vision statement that simply lists general principles accepted by everyone, but which have very little influence on actual results, versus concepts that lead to very specific actions and activities aimed at achieving the vision. In the context of this research, this means articulating a vision that includes statements concerning environmental quality and preservation that are implemented in subsequent planning activities, leading eventually to investment decisions that reflect a concern for environment quality. As will be seen in the following examples, this distinction can have important influence on the types of strategies that are considered in the planning process.

California Department of Transportation—The California Department of Transportation (Caltrans) is responsible for developing the transportation plan for the state of California. Developing this plan is accomplished in coordination with the California Transportation Commission (CTC) and with 45 regional transportation planning agencies (RTPAs). Sixteen of the RTPAs are MPOs and 29 are non-urban planning agencies. Since the mid-1970s, state law has required these regions to prepare regional transportation plans (RTPs) that focus on the specific challenges each is facing, and that are designed to assist local and state decision makers in shaping California's transportation future. According to state law, the California Transportation Plan must be consistent with the plans developed by other entities in the state, such as cities, counties, special districts, private organizations, tribal governments, and state and federal agencies. State law specifically prohibits the California Transportation Plan from being project specific. Caltrans also develops and disseminates guidelines for regional transportation planning to the RTPAs and MPOs so that the regional transportation plans are consistent with federal and state transportation planning requirements.

The transportation challenge facing California is formidable. California has the world's fifth largest economy, with much of the economic wealth dependent upon a functioning transportation system (e.g., California is the nation's leading global gateway for Pacific Rim trade with an estimated 37 percent of the value of all U.S. and foreign trade--an amount over $200 billion--passing through California's ports). Over 11 million people will be added to the current state population of 34 million by the year 2020, thus significantly stretching the capability of the transportation system to meet travel demands.

To prepare for this future, Caltrans has developed a state transportation plan that outlines the goals, policies, and strategies needed to meet the expected challenges. In developing this plan, an extensive public involvement process was used to

7) Funding mechanisms be put in place to achieve these visions.

The Maryland State Highway Administration (SHA) has adopted an organizational perspective that supports state laws as they relate to smart growth and environmental preservation. In particular, the SHA has articulated the following four principles to guide the agency's activities as they relate to the environment:

1. Meet or exceed all environmental laws and regulations applicable to SHA activities;
2. Incorporate and integrate smart growth, environmental protection and enhancement measures in planning, design, construction and operations;
3. Protect and enhance all aspects of the natural and human environment whenever possible, using available stat-of-the-art practices; and
4. Support advancement in environmental protection technology through innovation and technology transfer.

To provide organizational support for these principles, the SHA has hired staff specialists in such environmental areas as wetlands, streams and floodplains, noise abatement, storm water management, water quality, air quality, historic resources, archaeology, access for people with special needs, landscape architecture, socioeconomic impact assessment, erosion and sediment control, plant and wildlife ecology, forest creation, safety, hazardous waste management and pedestrian access and bicycle compatibility.

New York State Department of Transportation-- The New York State Department of Transportation (NYSDOT) has been a national leader in inculcating an environmental ethic into its organizational culture. In response to the governor's desire for more active state involvement in environmental quality, the NYSDOT launched an "Environmental Initiative" in 1998 to change its way of doing business. The Department moved away from a perspective of dealing with environmental issues simply as complying with regulations, to one where project construction and maintenance were viewed as an opportunity for improving the local environment, even if such efforts were not required as part of project approval.

New York state law has historically provided strong environmental protection of the lands surrounding state-funded transportation projects. Recently, however, state law was modified to allow the Department to undertake environmental enhancement projects off of a project's right-of-way. Article 2 of the State Highway Law, for example, gives the NYSDOT Commissioner the authority to acquire "property for recreational, natural, and scenic areas along, but not necessarily contiguous to, state highways....that shall lend itself to restoration, preservation or enhancement as a recreational, natural, or scenic area or provides visual access from highway to such area." The law further authorizes the Commissioner to spend state highway dollars to improve these areas.

One of the ways NYSDOT has incorporated environmental factors more seriously into its operations has been by changing Departmental policies and procedures. The most important policy with respect to the Environmental Initiative is the NYSDOT "Environmental Policy" that was issued in 2000. Key statements from this policy include (*63*):

This vision of what environmental stewardship meant to the state DOT was implemented through a variety of organizational changes designed to emphasize a continual commitment to enhancing environmental quality. These changes included appointing the first DOT's Deputy Secretary for Environment, Planning and Local Government Affairs; the creation of an environmental committee of the state's Board of Transportation; the appointment of a Board member with specific responsibility for representing environmental issues; incorporating environmental stewardship as part of the DOT's strategic plan, and the creation of a DOT Office of Environmental Quality.

In order to establish a consistent vision among its many different partner agencies, the NC DOT entered into formal agreements with such agencies as the U.S. Army Corps of Engineers and the state Department of Environment and Natural Resources. The major purpose of these agreements was to set a common mission for joint efforts at furthering transportation projects while preserving the environment. The memorandum of agreement among the three agencies, entitled a "process improvement memorandum of agreement", committed each of the agencies to work cooperatively to improve the process of "developing quality permit applications, issuing environmental permits, and mitigation that support timely delivery of transportation programs while minimizing disruption to the natural and human environment."

Portland, Oregon-- The state of Oregon enacted land use laws in 1973 requiring every city and county to have a long-range plan that addressed future growth and that achieved three objectives. These plans were to: 1) meet the expectations established by state and local comprehensive plans, 2) establish urban growth boundaries, which must contain an adequate supply of developable land to accommodate the expected growth in a 20-year period, and 3) protect natural resources (*64*). The state's land use goals were developed by the Land Conservation and Development Commission (LCDC). The Department of Conservation and Land Development (DCLC), the administrative arm of the LCDC, reviews and approves local comprehensive plans, a procedure known as "acknowledgement."

In 1992, Portland voters approved a home-rule charter that directed Portland Metro, the region's MPO, to make regional growth management its primary mission. This charter required Metro to adopt a future vision capturing a long-range statement of the region's *outlook* and *values* as well as a comprehensive set of regional policies on land use, transportation, water quality, natural areas and other regional planning mandates. The region's transportation system plan was to integrate goods and people movement with the desired community vision of surrounding land use. Metro used an extensive public outreach effort to help identify the outlook and values of the region by asking basic questions on livability that were later used to prioritize community values.

development decisions. By focusing on these decisions, and by putting in place strategies such as urban growth boundaries, the Portland region is attempting to pre-empt future environmental problems by making smarter decisions today. The community-led process of defining a consensus vision was the beginning of such an effort.

Puget Sound (Seattle), Washington-- The Puget Sound Regional Council (PSRC) is the transportation and growth planning coordinating agency for the central Puget Sound region of the state of Washington. PSRC's Vision 2020, the region's adopted long-range growth management, economic and transportation strategy, guides both the region's long-range transportation planning, as well as the short-range prioritization of projects and financial strategies. Vision 2020's primary goal is to create diverse, economically and environmentally healthy communities framed by open space and connected by a high-quality, multimodal transportation system that provides effective mobility for people and goods.

Vision 2020 was based on an analysis of five alternative growth and transportation strategies, including: no action, implementing existing plans, focusing development in major urban centers, focusing development in multiple centers, and allowing growth to disperse throughout the region. The process used in developing Vision 2020 is indicative of the important role that public outreach has in providing a sense of what type of future the public desires. Figure 8, for example, indicates the results of four major public involvement activities and how each activity led to a public expression of desirable futures for the Seattle region. This public process also led to the identification of the following five strategies that were to guide planning and decision making in the region:

1. Create a regional system of central places framed by open space.
2. Strategically invest in a variety of mobility options and demand management to support the regional system of central places.
3. Maintain economic opportunity while managing growth.
4. Conserve environmental resources.
5. Mitigate potential adverse effects of concentrating development by early action.

Figure 8 about here

Interestingly, the main theme that surfaced from the Vision 2020 effort was that land use and quality of life should come first. Transportation investment should then be targeted to achieve whatever goals are associated with both issues. In addition, the public supported conserving environmental resources by thinking about such issues early in the planning process (*65*). Similar to Portland, the Seattle region has long been known for its approach to environmental preservation and mitigation of project construction. It is not surprising therefore that the vision for the region, and thus the planning process that followed had an important role for considering environmental factors in the systems planning process.

Washington State Department of Transportation-- The Washington State Department of Transportation (WSDOT) is responsible for developing the state's long-range transportation plan. This plan is largely a policy document that sets policy for all transportation agencies in the state. One of the guiding visions for the Department is growth management, which has a particularly strong legislative foundation and widespread public support in the state. The Washington State Environmental Policy Act (SEPA) requires all cities and counties to develop a growth management plan. All

Actions: "A system-plan environmental evaluation (SEE) may be prepared in the case of proposals contained in system plans, if it is concluded they are major and significant new proposals .... (and) that if the plan recommendations are implemented, there will be subsequent project or site-specific environmental reviews.

SEE Content:"...it is recognized that, in most cases, the analysis of transportation alternatives, including multi-modal analyses where appropriate, will be qualitative, reflecting the broad level of generality of system plans. Therefore, by necessity, a SEE shall be more conceptual, qualitative, and general than is common with the individual project environmental reviews. A SEE, prepared as an integral part of a system plan, may address the following matters:

(a) The range of environmental effects, including the effects on sensitive land and water resources of systems plans.

(b) In non-attainment areas the range of air quality impacts which might be expected from system plan recommendations.

(c) The range of system plan effects on energy consumption.

(d) The relation of system plans to adopted regional development goals and plans, including potential effects of transportation on land use and land use on transportation demand.

(e) The range of anticipated effects of system plans on traffic congestion.

(f) The range of anticipated effects of system plans on economic development.

(g) The qualitative comparison of the costs of system plans and expected benefits.

(h) The range of effects of system plans on communities."

The most important benefit of the TRANS 400 process, as identified by WisDOT officials, was the early involvement of other agencies and interest groups in the environmental issues associated with transportation investment. For example, the early involvement of the Department of Natural Resources, the state's environmental agency, was considered a positive result of the SEE process. Coming to agreement early in the planning process on the goals of the study, how environmental factors were to be incorporated into the planning process, and developing a sense of what types of results were expected was considered by WisDOT officials as a very important factor in the success of the planning effort.

Table 5 about here

Eugene/Lane County, Oregon-- The Eugene-Springfield metropolitan area is the second largest metropolitan area in the state of Oregon, consisting of metropolitan Lane County and the cities of Eugene and Springfield. The region has an estimated 275,000 people and is anticipating significant population and employment growth over the next decade (the region's population is expected to grow by 41 percent over the next 12 years).

The Lane Council of Governments (LaneCOG), the region's MPO, is a voluntary association of 25 local governments and agencies. Because state law requires there to be a strong linkage between state goals, local comprehensive planning, and other jurisdictional plans, LaneCOG's transportation plan is closely allied with land use and environmental goals expressed in the General Plan for the metropolitan area (*68*). Given that transportation decisions are subsidiary to land use decisions, the objective of regional transportation planning is to offer several transportation choices for meeting travel needs in the most efficient and environmentally friendly manner, consistent with previously determined land use decisions.

The region's transportation plan, called TransPlan, was designed to meet two major goals:

- Provide an integrated transportation and land use system that supports choices in travel modes and development patterns that will reduce reliance on the auto and enhance livability, economic opportunity and the quality of life; and
- Enhance the metropolitan area's quality of life and economic opportunity by providing a transportation system that is balanced, accessible, efficient, safe, interconnected, environmentally responsible, supportive of responsible and sustainable development, responsive to community needs and neighborhood impacts, and economically viable and financially stable.

TransPlan included a performance and monitoring program to assess how TransPlan performs over time. Key performance measures included:

- Demographic variables such as population and employment, congestion, vehicle miles traveled;
- Trip length variables such as internal vehicle miles traveled (VMT) per capita, average trip length and percent of person trips under one mile, mode shares for all trips;
- Environmental variables such as average fuel efficiency and carbon monoxide (CO) emissions;
- Land use measures such as acres of zoned nodal development, percent of dwelling units built in nodes, and percent of new total employment in modes; and
- System characteristic measures such as percent of roadway miles with sidewalks, percent of roadways in fair or better condition, percent of households within quarter mile of a transit stop, transit service hours per capita, percent households with access to 10-minute transit service, percent employment with access to 10-minute transit service and bikeway miles and fatalities.

These data are collected for the transportation system and compared with projections that come from the regional plan.

- Design and coordinate transportation projects, facilities, programs and services to reinforce local land use plans and economic development initiatives that support Smart Growth principles, and
- Work with local communities to increase their understanding of Smart Growth principles and opportunities to incorporate Smart Growth into local plans and visions.

There is one policy objective for responsible environmental stewardship:

- Minimize impacts on, and strive to enhance, Maryland's resources.

The environmental factors considered in Maryland's system planning process are considered at a strategic policy level. Collectively, the goals and policy objectives may be viewed as guiding principles for Maryland's transportation planning process.

Similar to the experience in New York, Maryland transportation officials stated that it was very important to emphasize the importance of environmental considerations at the beginning of the planning and project development process in order to guide infrastructure and policy decisions away from environmentally unsatisfactory results. Maryland's State Highway Administration has assumed a national leadership role in fostering context sensitive solutions in project development. This could not have occurred if policy sensitivity to environmental quality was not an organizational standard. In addition, Maryland's very strong growth management law has provided a context within which environmental quality can be linked to community development goals and objectives.

Minnesota Department of Transportation (Mn/DOT)— The Minnesota Department of Transportation (Mn/DOT) has a long history of statewide transportation planning that is recognized nationally as being at the forefront of planning process and methodology. For example, with the passage of ISTEA, Mn/DOT refined its statewide transportation planning process to incorporate several new concepts, the most important being the use of performance measures to monitor progress of the statewide, district, and business plans of the agency; and the identification of and the targeting of resources on a statewide system of interregional corridors. Both concepts are considered key elements to the approach for updating the statewide transportation plan that is currently underway.

The Mn/DOT's planning and programming process consists of several key elements.

- *Strategic Plan*: Defines Mn/DOT's mission and vision for meeting customers' needs.
- *Statewide Transportation Plan*: A policy document that outlines the directions and policies that are to be used in achieving the strategic plan and in attaining desired performance goals.
- *Modal Plans, District Long-Range Plans, Interregional Corridor Plans:* More specific, system and service deficiency-oriented plans that identify the improvements needed to meet goals.
- *Capital Programs:* Programs of capital and service improvements needed over the next 2 to 10 years.
- *State Transportation Improvement Program (STIP):* The 1 to 3 year capital program for state investments.

One of the goals for the Minnesota DOT (Mn/DOT) mandated by state law is "to ensure that the planning and implementation of all modes of transportation are consistent

- *Environment:* Mn/DOT is a proactive, responsible, environmental steward.

  --Percentage of residential areas in incorporated areas exposed to excessive noise

  --Number of wetland acres impacted and replaced by Mn/DOT

- *Socioeconomics*: Transportation investments will yield the highest possible economic return to the region, tempered by an evaluation of community values and social impacts.

  --Total vehicle miles traveled and freight ton miles

  --Maintenance and construction expenditures per vehicle mile traveled

  --Percentage of highway funds going to construction

In 2000, Mn/DOT shifted the focus of its performance measurement. A primary measurement framework now emphasized four strategic objectives: interregional corridors, multimodal investment, program delivery, and information dissemination. Many of the measures developed in the 1990s were still used in this new framework. In fact, many became even more important in that performance targets were now set for many of the measures.

A draft set of outcome measures for the policies shown in Table 6 includes similar types of measures as those described above. It is interesting to note in the environmental area that, instead of performance measures, Mn/DOT officials are considering the use of indicators to monitor environmental system conditions and performance. Indicators are defined as "a set of consistent trend data reported over time that provides important historical or predictive information on a changing condition of strategic importance." Thus, monitoring key environmental condition indicators gives an indication of whether these conditions are improving or worsening. However, such changes might not be directly related to Departmental activities.

An Mn/DOT advisory committee has identified five areas where indicators are considered appropriate.

Air:	Air quality, fleet emissions
Water:	Water quality, water quantity, wetlands and erosion control
Land:	Habitat/wildlife, special parks/wildlife and recreation areas, vegetation quality/sustainability
Community and	Context sensitive solutions, environmental justice,
Quality of Life:	noise
Operations:	Construction sustainability, maintenance waste materials management

Mn/DOT officials are still developing a final set of indicators for these categories. An example of the type of indicators being considered includes for air quality, "ambient concentrations of pollutants and greenhouse gases."

The Mn/DOT example illustrates one of the most extensive efforts in the U.S. by a state DOT to develop and use performance measures in its management of the statewide transportation program. Interestingly, environmental stewardship is part of the list of measures that provide such guidance. In addition, Mn/DOT is considering the use of

- Promote telecommuting as an alternative to traditional work travel
- Implement the objectives contained in the Statewide Bicycle and Pedestrian Master Plan

For each objective, one or more performance measures have been developed as well as quantitative targets to be met within designated time frames. Table 7 shows examples of such performance measures and targets for selected objectives. Each year, the Department reports on its progress toward achieving the preset targets or objectives. It also provides an assessment of whether it is on track with meeting the overall objective at the end of the allotted time frame.

Table 7 about here

Southern California-- Southern California is the largest metropolitan area in the country. Encompassing 38,000 square miles, and home to more than 17 million people (approximately one half of California's population), Southern California has one of the largest concentrations of employment, income, business, industry and finance in the world.

The Southern California Association of Governments (SCAG) is the MPO for six southern California counties and 184 cities. Like many of the larger MPOs in the country, SCAG faces several challenges and opportunities in providing effective transportation services and infrastructure in such a multi-jurisdictional environment. While Southern California is one of the most prosperous and productive metropolitan areas in the world, the metro area is currently grappling with urban congestion and air quality issues. Projected growth over the next two decades has the potential to exacerbate these already critical issues

SCAG's Regional Transportation Plan has identified six regional goals and several corresponding supporting policies (*71*). One of the goals states that the plan will "ensure that transportation investments are cost-effective, protect the environment (including air quality), promote energy efficiency and enhance the quality of life." In addition, two other goals reinforce priorities that will protect the environment, including:

- Encourage land-use and growth patterns that enhance the livability of our communities and maximize the productivity of transportation investments.
- Develop regional transportation solutions that complement the subregional transportation systems and the land use plans of communities within the subregions.

SCAG has also adopted a performance-oriented approach toward systems planning and decision making. Environment-oriented measures that SCAG monitors on a periodic basis include:

--measures for vehicle emissions and particulate matter;

--mobility measures that capture such system attributes as the average work trip travel times and percent of PM peak travel in delay;

--accessibility measures that capture such user-based attributes as work opportunities within 45 minutes of door-to-door travel time and average transit access time,

automobile, provides for alternative modes of transportation, and serves the basic transportation needs of the citizens of the Tahoe Region, supports the economic base of the Region in the movement of goods and people, and minimizes adverse impacts on man and the environment.

(4) It is the goal of the Regional Transportation Plan to provide for the reactivation of the Tahoe Transportation District to enable the TTD to fulfill its role as defined by the Tahoe Regional Planning Compact.

(5) It is the goal of the Regional Transportation Plan to research potential funding sources as referenced in the RTP-AQP Capital Improvement Program and as referenced in the Lake Tahoe Transportation Summit Final Report, dated June 20, 1991.

As noted earlier, TRPA monitors progress toward achieving environmental capacities by measuring a selected set of environmental indicators. These indicators are shown in Table 8. The Compact requires that TRPA assess the progress toward these indicators at least once every five years.

Table 8 about here

Toledo, Ohio-- The Toledo Metropolitan Area Council of Governments (TMACOG) is a voluntary association of local governments in northwest Ohio and southeast Michigan responsible for intergovernmental cooperation and planning. Planning responsibilities include the adoption of area-wide plans and policies for transportation, land use, water quality and the environment.

To establish a direction for the 2025 regional transportation plan, the TMACOG Transportation and Land Use Committee adopted a statement of goals and objectives based on a vision statement for the region's transportation system that was developed at annual regional meetings of transportation stakeholders (*72*). The four goals were:

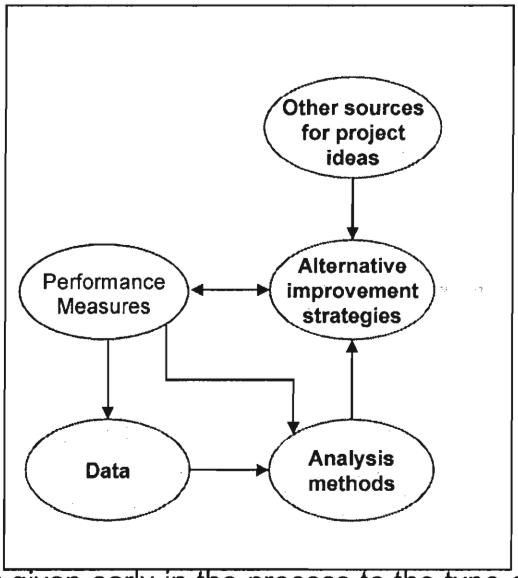
- Enhance the region's economic competitiveness in the global economy
- Be an integrated intermodal transportation system
- Be a sustainable system
- Enhance the region's quality of life

Table 9 shows the 12 supporting objectives for the established goals.

The goals and objectives shown in Table 9 provide an interesting example of how goals can be given different levels of importance in the decision making process. As shown in Table 9, two goals, those relating to economic competitiveness and the intermodal nature of the transportation system, are considered to be primary or "driving" considerations in the decisions for selecting projects and strategies. Two other goals are considered to be "screening" goals, that is, goals relating to concerns about the impacts associated with transportation system performance. The concept of sustainability is also incorporated into the environmental goal, where it is defined primarily as an effort to minimize the environmental impact of the transportation system.

THE ENVIRONMENT....AND THE ANALYSIS PROCESS

As noted earlier, a more detailed discussion of the analysis tools and methods that could be used for environmental assessment at the systems planning level will be presented in Chapter 4. However, three concepts merit attention at this point. The first is the effort of identifying environmentally sensitive and critical areas very early in systems planning so that decision makers know at the beginning of the process where important natural and community resources are located.



The second concept is the range of alternative strategies that can be considered as part of the planning and project development process. Transportation agencies not surprisingly focus their efforts on identifying transportation alternatives, with very little thought given early in the process to the type of strategies that might be needed to enhance the environment. As will be seen below, a wide range of strategies can be considered as part of project development and planning that are aimed at improving environmental quality in general.

The third concept is the definition of an "environmental alternative" as one of the alternatives to be examined as part of the analysis of alternatives. An environmental alternative is defined in such a way to purposely avoid environmentally sensitive areas. This might mean redirecting investment to other parts of a study area, possibly substituting one form of transportation for another (e.g., meeting travel demand through transit or telecommunication substitution for automobile travel), or reducing travel demand through travel demand management (TDM) strategies.

These three concepts are very much related in that the goal of an environmental alternative is to avoid sensitive environmental areas as much as possible, or at least to mitigate negative impacts. Such an effort relies on an analyst's ability to locate sensitive environmental resources.

Identifying Environmentally Sensitive Areas and Resources: The consideration of environmental factors early in systems planning requires that analysts be able to identify where possible impacts could occur. With the advent of geographic information systems (GISs), which will be discussed in more detail in Chapter 4, the development of databases that include spatially located environmental resources is quite feasible. Using these databases, agencies examining impacts at the system or corridor levels can conduct "red flag" analyses to identify significant environmental resources located in a particular study area that could be a barrier to implementing a transportation improvement. Two examples illustrate the concept of identifying such environmentally sensitive areas.

Cape Cod, Massachusetts--The Cape Cod Commission has identified a long list of regionally-important resources that may be vulnerable to damage from development. These resources include: water recharge areas, wetlands, ponds, floodplains, habitat areas, conservation lands, open space, historic resources, regional facilities, and water supply/distribution systems. All of these critical resources have been mapped on a

feet of streams) impacts that would occur over the next seven years with many new state highway projects to be built on new alignment.

The intent of this effort was to disassociate compensatory ecosystem mitigation from permit approval processes and project reviews. Unavoidable impacts to ecosystems would be offset by developing a statewide program of compensatory ecosystem mitigation projects that would be in place before project-level impacts were identified. This effort, in essence, would result in a net increase in wetland and riparian functions in the affected watershed, as well as in the state.

According to DOT officials, the benefits of this program are:

- Compensatory mitigation is removed from the critical path of transportation project development by having such replacement functions already constructed prior to project development.
- Project impacts and proposed mitigation can be "bundled" to deal with cumulative impacts in a comprehensive watershed perspective.
- Given a watershed level approach, the greatest ecological benefit will accrue with the comprehensive nature of the compensatory mitigation.
- The NCDOT will be able to provide a pro-active approach toward environmental stewardship that is consistent with the goals of other state and federal agencies.
- Less staff time will be needed for project-level permit approval processes.

The basic analysis approach to developing adequate compensatory watershed mitigation is the use of a watershed assessment methodology that will define the loss of ecosystem function that might occur with different types of transportation project construction. This methodology will be used to develop Watershed Restoration Plans. These plans will be based on standard protocols for establishing goals and objectives for each watershed, as well as identifying desired mitigation strategies. It is expected that the watershed assessments will be integrated into a state GIS layer that can then be used by NCDOT planners in the early stages of project planning.

Riverside County, California—The Riverside County Integrated Project (RCIP) is one of the best examples of relating land use planning, environmental assessment and transportation infrastructure. Riverside County is one of the fastest growing counties in California and in the U.S., with its population expected to double from 1.5 million to 3 million in the next 15 to 20 years. This surge in population was expected to place significant pressure on the County's environmentally sensitive habitats, especially with the need to add new transportation infrastructure in meeting future demands. In 1999, County officials in cooperation with federal and state officials initiated a planning effort designed to integrate land use, transportation, and conservation planning before infrastructure and project-specific plans were developed. Instead of the traditional approach of mitigating impacts after project planning had occurred, the RCIP was an effort to put such planning into a much broader context that would not only result in better project decisions, but also decisions that could be expedited to implementation.

RCIP consisted of several elements:

- An updated General Plan for that portion of the county expected to face the most development pressures.

--Provide implementing mechanisms that minimize the potential for wildlife agencies to suspend the County's permit as a result of local jurisdiction action on an individual project, and that minimize the role of wildlife agencies in future project decisions.

So far, approximately $30 million has been spent on the development of the RCIP and early implementation. The effort has included most of the important environmental, planning and transportation agencies at the federal, state and local levels. Critical to the success of this multi-agency, multi-jurisdictional effort was the existence of a local political champion, who initiated the idea and nurtured it through the institutional approval structure. The success of the effort was apparent in 2002 when County voters approved an initiative to tax themselves to fund both transportation and habitat conservation projects. The many different elements of the RCIP that make it unique, but also successful, are shown in Figure 10.

Figure 10 about here

A Range of Strategies—The analysis process for a typical major transportation investment decision usually focuses on a small number of alternatives. However, as was seen in the following two cases, the types of strategies that can be considered by transportation agencies to mitigate or enhance environmental quality can range widely.

New York State Department of Transportation (NYSDOT)—The NYSDOT has emphasized the enhancement of the natural environmental as part of project construction and implementation for many years. Table 10 shows the types of "environmental initiative actions" that have been incorporated into the DOT's standard operating procedures. These actions are not the type of alternatives that can necessarily replace the need for mobility or safety improvements, but they do represent an organizational commitment to go beyond the usual project requirement for mitigation. These actions are designed not to simply reduce environmental impacts, but also to enhance the quality of the environment surrounding a project.

NYSDOT has also made a very strong commitment to a context sensitive solutions program that emphasizes the consideration of many of the types of strategies shown in Table 10 as part of the community-based design process. Consideration of these strategies, which occurs very early in the project planning process, becomes a significant part of the community effort to enhance the surrounding environment, not just mitigate project impacts.

Table 10 about here

Tahoe Regional Planning Agency (TRPA)—The types of strategies considered as part of TRPA's planning and enforcement program are likely the most wide ranging in the U.S. (*74*). The environmental strategy for the region is defined in a document called the environmental improvement program (EIP). The EIP is viewed as the implementation strategy for the TRPA Regional Plan. The EIP, which identifies capital projects targeted at improving the condition of environmental resources, includes transportation projects (the 2001 update of the EIP identified $908 million in project needs over 10 years; $1.3 billion over 20 years). The EIP also includes strategies relating to research and study needs, program and technical assistance, and operations and maintenance costs.

In addition to the range of strategies found in the EIP, TRPA's regulatory authority allows it to allocate residential and commercial units for new development, employ

portion of the region, which had experienced one of the fastest growth rates for comparable areas in the U.S. over the past decade. With a population of over 1.3 million and employment of 800,000, this northern area was considered the economic "heart" of the region.

The study began with an effort to identify strategic "themes" through an extensive public participation effort. Different transportation and land use scenarios were then defined to emphasize the characteristics of each theme. One of the themes was the desire to preserve and enhance the environmental quality in the study area, as well as the region. Accordingly, the study defined an "environmental scenario" that consisted of transportation infrastructure and service improvements, land use/development policies, and policies targeted at reducing travel demand. Other scenarios included meeting transportation needs, promoting growth in existing urban centers, emphasizing transit service, promoting equity in transportation investment and resulting burdens, and implementing all of the plans prepared by local communities (regardless of their relationship to the regional plan).

Figure 11 shows the environmental scenario that resulted from the analysis process. In the southern part of the study region, future growth was clustered along existing transportation corridors and around existing urban areas to avoid impacting environmentally sensitive areas. The northern part of the study area was targeted for

managed growth, which used such strategies as conservation subdivision ordinances, cluster housing, and targeted higher densities to minimize impact on the natural environment. Increased emphasis was placed on transit investment to support higher density development sites, and major freeway corridors included high speed, high capacity transit services in dedicated rights-of-way.

Figure 11 about here

Perhaps unsurprisingly, the environmental scenario showed the smallest impact on the ten environmental criteria that were part of the evaluation process. Common elements of each of the scenarios, including many elements from the environmental alternative, were combined into three system alternatives that proceeded into more detailed analysis.

Lake Tahoe Region—One of the earliest examples of an "environmental alternative" occurred in 1989 with the development of the Truckee Meadows-Washoe County regional plan in the Lake Tahoe region (*75*). This plan, mandated by state legislation, required city and county master plans to comply with the development and environmental goals for a region. One of the first steps in developing the regional plan was to establish community consensus on future development patterns for the region, as well as on desired environmental quality and community quality of life. The evolution toward an agreed upon urban form included consideration of different alternatives, each of which focused on a theme that emerged from a comprehensive public outreach effort. The best and most desirable elements of each alternative were then combined into a recommended urban growth concept for the region.

Four major alternatives included:

Current Trends Concept: This alternative illustrated the consequences of continuing the development trends that had occurred over the past decades. These trends resulted in the continued decline of existing centers, the degradation of environmental quality, increased traffic congestion, increased fiscal stress associated with governments trying to "keep up" with demands, and the loss of open space.

Table 11 about here

California Department of Transportation (Caltrans)—Caltrans has been a national leader in designing transportation projects in environmentally sensitive ways. It was also one of the first state DOTs to enter into memoranda of agreement with environmental resource agencies to expedite project delivery. In recognition of the need for project design to reflect community values as well as respond to federal and state law, Caltrans has embarked on several innovative project planning efforts that have actively involved a range of stakeholders very early in the project planning process. The term used for the partnering in these jointly planning projects is forming an "alliance relationship (*76*). The intent is to bring diverse interests together in a common forum to frame the issues and to develop a common understanding of what the project is intended to accomplish. In addition, on those issues for which there is disagreement, joint analysis of the underlying facts would perhaps allow some softening of the positions. As noted in conjunction with a freeway project in Monterey County, California, the benefits of these alliance relationships were determined to be:

1. Identification of shared values
2. Joint fact-finding
3. Collaborative innovation
4. Indispensability (i.e., wanting to feel like you are an important part of the solution)
5. Decision sustainability
6. Lasting relationships
7. Shared success

Importantly, alliance relationships result in more than just psychological and process benefits. Experience has shown that the need and purpose statements that result from such an effort reflect a more diverse set of values and are more readily accepted by environmental constituencies. Project scopes and budgets are more reflective of the types of work that must actually occur. And to a large extent, the participants in the alliance relationship develop a shared ownership over project implementation, most often leading to success.

One of the important steps in this process is defining the evaluation criteria that will b be used to assess the relative importance of different alternatives. Part of the alliance relationship effort is to jointly define such criteria, and to establish the relative weight that each will have in project planning. Figure 13 shows the results for one freeway project. Participants in project planning were asked to identify what they thought were the most important evaluation criteria associated with the project. Each participant was allowed to assign points to each criterion, and the average of all the assigned points for a particular criterion was used to determine a weight for that factor. As can be seen in Figure 13, only one criterion was considered more important than minimizing environmental impacts, and that was reducing accidents. This result led to efforts to design the project in the most environmentally benign manner possible, while still meeting mobility and safety concerns.

Figure 13 about here

The programming screen occurs before a project enters the FDOT work program. The ETAT review at this level satisfies the "agency scoping' requirements of NEPA, and is much more specific as to the types of impacts that will likely occur for a particular project. In addition, the ETAT identifies the types of technical studies necessary to satisfy federal and state environmental laws. ETAT members are also able to indicate that their agency no longer needs to be involved with project development given the scope of the project *proposed*.

One of the important tasks in this process is the acceptance by ETAT agencies of the purpose and need statement for specific corridors, after the screening (or evaluation) has been initially conducted. ETAT members can provide comments or suggest modification to this statement. However, by putting this statement into the process for both the planning and programming screen, FDOT expects to save considerable time in coming to agreement concerning the definition of purpose and need as project development begins.

San Francisco Bay Area-- The Metropolitan Transportation Commission (MTC) is responsible for long range transportation planning in the San Francisco Bay area, a nine-county region with over seven million people. "Environment" is one of the six broad policy goals identified in the 2001 Regional Transportation Plan (RTP), alongside other goals such as mobility (of persons and freight), safety, equity, economic vitality and community vitality.

The RTP's environmental goal is to plan and develop transportation facilities and services in a way that protects and enhances the environment. Several environmental concerns have historically been issues in the Bay Area, including air emissions, noise from transportation sources, impacts on the Bay and on wetlands, visual impacts of projects, community disruption and seismic safety. The RTP identifies several objectives for protecting and enhancing environmental quality, including the following:

- Evaluate the regional environmental effects of the RTP
- Ensure that project level impacts are addressed and mitigated prior to MTC approval of state and federal funding
- Ensure that MTC's plans and programs conform to the federal ozone attainment plan and support reductions in mobile source emissions required in the State Clean Air Plan
- Support programs directed at improving traffic flow on local streets and freeways to minimize vehicle emissions and excess fuel consumption
- Provide alternatives to traveling in single occupant vehicles and incentives to carpool or take transit

The MTC is responsible for preparing and adopting an Environmental Impact Report (EIR) for the RTP, a systems level analysis of the RTP required by the California Environmental Quality Act (CEQA). The intent of the EIR is to assess the range of impacts that the proposed measures in the plan are likely to have on regional environmental quality and quality of life. Conducted as a program level environmental assessment, the EIR evaluates the proposed RTP, identifies any significant adverse regional impacts, and proposes measures to mitigate them.

An EIR of the 2001 RTP examined four transportation system alternatives in addition to the proposed system plan in the RTP. The analysis focused on regional, corridor level and cumulative impacts. The alternatives were evaluated for their impacts on air quality,

Wisconsin Department of Transportation—Wisconsin's legal requirement for a systems-level environmental evaluation (SEE) of all statewide transportation plans created a significant challenge to WisDOT officials. How was one going to provide substantive information on the likely environmental impacts of plans defined at very high levels of aggregation and that focused on the use of alternative policies to influence transportation demand and financing?

The approach adopted for the SEE was similar in concept to the environmental analysis that might be conducted for a project. For example, in a recent update of the state's highway plan, the SEE compared the environmental consequences of the recommended highway plan alternative to those associated with three other alternatives considered during the planning process. The alternatives included:

> Alternative 1 (Base Case): High priority given to pavement/bridge preservation, safety improvements; lower priority given to traffic movement and economic development goals.
>
> Alternative 2: Priority given to investments in strategic corridors; lower priority given to non-corridor roads.
>
> Alternative 3: Priority given to all goals for the entire state trunk highway system.

The types of environmental criteria considered for each of the system alternatives included: air quality, energy consumption, sensitive land and water resources, indirect land use impacts, economic development consequences, and community and neighborhood impacts. For each of the impact categories, the SEE analysis provided a description of the types of mitigation that would likely be implemented for the different projects and impacts being considered. In each case, previous WisDOT experience with the mitigation strategy was highlighted. Table 14 shows the results of this evaluation.

As was mentioned in the San Francisco example, Table 14 is indicative of the level of detail that often accompanies systems-level environmental assessment, especially when the plan consists primarily of policies, and not specific projects. In this case, WisDOT officials did attempt to show a subjective assessment of how one system alternative compares to each of the others.

Table 14 about here

and consultant resources; set aside funds to support this activity; create task forces to focus on more specific improvements to the process; jointly establish measurable goals, objectives and time frames for streamlining activities; consider adding project development liaison engineers in the central office and environmental managers in the district offices; and consider combining preliminary and detailed design activities into one process.

- *Planning/program:* Develop a strategic plan and action plan for program delivery streamlining; incorporate provisions for streamlining into Mn/DOT business planning; and conduct a streamlining workshop as part of the scoping process for every new major project.
- *Communications*: Develop a communications strategy for disseminating information on streamlining activities to stakeholders; implement pilot projects; develop an annual conference that highlights good practice.
- *Training:* Develop training programs on project streamlining.

Mn/DOT acted on these recommendations by re-forming the original task force as an "Oversight Committee", and included representatives from FHWA and the construction industry. Several Mn/DOT staff members were assigned full time to the streamlining activity. Three task forces were created to focus on project development issues in the environmental analysis, design and right-of-way functions. The recommendations from these three task forces were extensive and covered every aspect of pre-construction activities. The recommendations that relate most to this research were as follows:

- Central office review of roadway plans will be focused on critical plan errors only.
- A certification process will be used to validate a consultant's or District Office's capability to conduct traffic forecasts without Central Office oversight.
- Project memoranda that do not require FHWA approvals should be the responsibility of the district offices; in the future, the FHWA-approved projects could also be shifted to the districts.
- A project liaison unit with responsibility for expediting project delivery and becoming a program delivery advocate for pre-construction activities should be established.
- The current initiative of funding environmental resource agency staff should be evaluated before expanded to other agencies.
- Environmental coordinator positions should be established in all district offices.
- Early agency coordination and letters of understanding should be used more in developing interagency cooperation on project development.
- Programmatic agreements with the State Historic Preservation Office and Native American tribes should be concluded as soon as possible.
- Concise environmental impact statements should be used where feasible.

Figure 14 shows the expected savings for three types of projects—major construction, reconditioning, and resurfacing that would occur if these recommendations were implemented. The reduction in project delivery time compared to existing processes was 30 percent for major construction projects, 33 percent for reconditioning projects, and 17 percent for resurfacing-type projects. Of the 42 different streamlining initiatives

Oregon Department of Transportation—Two initiatives illustrate the important linkage between the environment and transportation that is found in the project development process in Oregon. The Collaborative Environmental and Transportation Agreement for Streamlining (CETAS) is a formal agreement among ODOT, resource agencies involved in approving Environmental Impact Statements (EIS), land use planning agencies and the Federal Highway Administration (FHWA) for streamlining environmental decisions in transportation planning. CETAS strives for full communication, participation and early involvement in major transportation projects of all agencies that have a role in environmental quality.

ODOT has identified six major elements to an agency initiative that enhances efficient project delivery, while at the same time promoting environmental quality. These six elements include:

- *Environmental management system*—process for examining the life cycle impacts of ODOT's activities.
- *Habitat mitigation program*—purchasing or creating wildlife habitats in anticipation of future project impacts.
- *Natural and cultural resource mapping program*—mapping of sensitive natural and cultural resources, combined with a database from resource agencies, using a GIS
- *Expanded programmatic approvals*—using programmatic agreements with resource agencies to provide expeditious approvals of agreed upon impact categories
- *Local government and contractor performance*—training staff and consultants on environmental management practices.
- *Expanding CETAS partnerships*—entering into agreements with other federal, state and local agencies to become part of the CETA program

ODOT officials anticipate that the CETAS approach will result in improved cooperation and efficiency among agencies, greater protection of sensitive environmental resources, and projects completed within budget and on time.

The second initiative relates to the NEPA planning process. By the early 1990s, ODOT staff had determined that major investment studies (MISs), the then major approach for the planning of significant federally-supported transportation projects, did not provide a sufficient basis for removing alternatives from further consideration. This led to the idea of a Tiered Environmental Impact Study (Tiered EIS), in which an EIS is performed at different levels of detail during various stages of planning and project development. The Tiered EIS process is typically applied to major transportation projects that are expected to have notable impacts on the environment. A "Location Environmental Assessment (EA)" is prepared early in the project planning process using existing data found at a fairly coarse level to address such issues as what project impacts might occur in sensitive environmental areas. Later in the project development process, a "Design EIS" is prepared at a more detailed level appropriate to the design proposed in the corridor.

ODOT has so far conducted only one Location EA. This Location EA examined a nine-mile stretch of highway that included three rural communities and one of the most popular tourist destinations in Oregon. The highway is also the primary route to the central Oregon coast from the Portland and Salem metropolitan areas. The highway had two lanes with at-grade intersections and direct access to adjacent properties. The

species issues affecting Department projects. In 1999, the PMC approved the funding of four additional positions to support major projects in one PennDOT district that was facing significant environmental project challenges. A total of 16 positions in nine state and federal agencies have been funded at an 80/20 federal-state match, with PennDOT and the Pennsylvania Turnpike Commission splitting the 20 percent local contribution (*80*).

Other PennDOT activities that promote improved or expedited consideration of environmental issues in transportation decision making include:

Environmental streamlining: PennDOT conducts agency coordination meetings with state and federal resource and regulatory agencies to review projects, identify impacts and develop mitigation plans for projects. These meetings are attended by all federal and state agencies that either play a regulatory or advisory role relative to environmental or social resources, including the US Army Corps of Engineers, US Environmental Protection Agency, the Pennsylvania Department of Environmental Protection and the Pennsylvania Game Commission.

- *Addressing secondary and cumulative impacts of projects:* PennDOT works closely with regional and local governments to identify the potential secondary and cumulative impacts of projects and to develop strategies that can be used to control these longer term problems that could result from projects.
- *Innovative tools/procedures*: PennDOT has contracted with a state university to develop a catalog of major cultural and historical sites in the state. The Department is also in the process of developing an electronic expert system to guide users through the project development process (*81*). The 10-step process flow diagram ensures that transportation projects are developed in an environmentally sensitive manner that reflects agency and public input.

Washington State Department of Transportation (WSDOT)— Like all DOTs, WSDOT funds mitigation efforts to identify less harmful alternatives or to minimize and mitigate adverse impacts. However, the levels of funding dedicated to this purpose in Washington shows a much higher level of commitment to such efforts. At present, WSDOT spends approximately 16% of its total project funds on environmental protection and mitigation. WSDOT has also developed an environmental retrofit initiative to reduce the impact of existing transportation facilities and services on air, water, habitat and watershed quality; minimize the use of resources; and increase the use of recycled materials. WSDOT expects to spend approximately $8.1 billion to address environmental issues over the next 20 years (*66*).

With respect to the project development process, WSDOT officials have identified 38 federal and state regulations and local ordinances that can affect the Department's operations (*82*). WSDOT maintains an *Environmental Procedures Manual* to clarify the rules and regulations that pertain to each part of the project development process.

A recent law, the Transportation Permitting Efficiency and Accountability Act passed in 2001, streamlines the environmental permit process for transportation projects. This Act links planning and project development so as to reduce the redundancies in the processing of environmental documentation. In particular, WSDOT is granted authority to prepare certain permits, although permitting agencies retain approval authority. A Transportation Permitting Efficiency and Accountability Committee (TPEAC) has been created consisting of 17 members including legislators, representatives from the Departments of Ecology, Fish and Wildlife, and Transportation, local governments and

on the Cape, is also a good example of how policy-level guidance can provide greater sensitivity to environmental considerations as they relate to development and infrastructure decisions.

The Eugene/Lane Council of Governments example shows an MPO using a well-integrated approach to land use, transportation and environmental planning that occurs within a broader state-defined legislative framework. This framework requires statewide comprehensive planning, with transportation as just one element of the overall comprehensive plan. The case study highlights the evaluation of alternative plan scenarios based on well-articulated criteria to enhance accessibility, support predetermined land use choices, protect the environment and preserve regional quality of life. These attributes are tracked through multiple measures of performance. This case study also illustrates a process in which environmental quality is achieved primarily through land use strategies. Transportation planning is thus viewed as a supporting activity for land use goals.

The Florida case study described a long-term involvement on the part of a state DOT in linking environmental factors to transportation planning and programming. FDOT has been a national leader in context sensitive solutions and community impact assessment. These efforts have been integrated into a new approach for screening plans and projects earlier in the planning and project development process to identify critical environmental and community impacts. An extensive involvement of transportation and environmental agency staff in developing the ETDM process is an indication of the level of effort that might be necessary at developing a similar process statewide.

The important role of technology in fostering the exchange of information is also well illustrated by this case study. It is not likely that resource agencies would participate in the ETDM process if they did not have access to the GIS web-based Environmental Screening Tool. The rapid exchange of information and the visualization capabilities of identifying the extent of potential environmental impacts have provided an important enabler for the type of process that FDOT is spearheading.

The Maryland case study is a good example of evolving transportation planning in the context of a smart growth framework where increasing emphasis is placed on transportation improvements that will support smart growth from the outset rather than focusing solely on project mitigation at the end of project development.

The Minnesota case illustrates the use of performance measures/indicators in transportation planning, and how environmental considerations can be included in such an approach. In addition, MnDOT's experience with project delivery streamlining and context sensitive design is directly relevant to the different types of strategies that could be used for better linking planning and environmental factors.

The New York State DOT example illustrates the significant progress that can be made in linking environmental quality to the everyday activities of a state DOT. This has been done by modifying the mission of the organization and by establishing a new value system among DOT employees. The internal NYSDOT engineering procedures have been modified to reflect this new environmental ethic and to provide an institutionalized means of keeping this new approach in place over the long-term. New staff capabilities were introduced into the organization, and new approaches to planning and design were employed. The results have shown that not only does an environmentally sensitive approach toward planning, design and operations provide for better decisions, but it also expedites project delivery.

and decision making process. In addition, this case study illustrates quite well the concept of environmental carrying capacity, and the use of environmental performance measures.

The Toledo case, which represents a typical MPO approach toward transportation planning and environmental concerns, introduces the use of a formalized multi-attribute framework for the analysis of plan alternatives. The transportation plan was developed through an extensive process of public involvement and with important input from the public and private sectors. It is interesting to note that one of the four goals that guided plan development was to create a "sustainable transportation system." By this was meant the reduction in transportation impacts on the natural environment. In addition, enhancing environmental quality was part of another plan goal aimed at improving the quality of life in the region. These goals were applied as various environmental attributes in the multi-attribute scorecard.

The Washington State DOT case study highlights the important role that legislation can play in elevating environmental considerations to a high level of priority in planning. In addition, it demonstrates the importance of funding to develop the required tools and human resources to support new planning procedures and techniques. It also illustrates the importance of formalizing institutional arrangements to advance environmental considerations in transportation planning and achieving environmental stewardship in a cost effective manner.

Finally, the Wisconsin DOT case study shows the impact of a state rule that requires environmental assessment of transportation system plans, and the level of analysis that accompanies such an assessment. The most important benefit of the TRANS 400 process, as identified by WisDOT officials, was the early involvement of other agencies and interest groups in the environmental issues associated with transportation investment.

One aspect of the Outer Cape Capacity Study that was directly aimed at bringing environmental considerations into transportation planning early in the process was the use of an environmental sensitivity index. The intent of this index was to identify the amount and proximity of environmental resources to critical transportation facilities. The index was a sum of weighted scores assigned to four environmental resources--wetlands/surface water bodies, rare species habitat, rare plant habitat, and critical upland areas. The index was applied to Route 6, the major highway serving the length of Cape Cod. A 100-meter band on each side of Route 6 was established as a required boundary. A score for each resource was given on the basis of the distance from the centerline of the road. A score of 100 was assigned if the centerline passed directly through the resource; the score decreased linearly with distance in the bandwidth. The indices for each of the four resource areas were then averaged to determine the environmental sensitivity of the surrounding environment for Route 6. Figure 16 shows the locations along Route 6 having varying degrees of environmental sensitivity. Wider bands indicate greater sensitivity.

Figure 16 about here

Florida Department of Transportation (FDOT): FDOT's Efficient Transportation Decision Making (ETDM) process is one of the most advanced in the U.S., especially when considering the level of technical support that has been provided to make the ETDM process successful. As noted in Chapter 3, the foundation of the ETDM process is the Environmental Screening Tool. This Internet-based, GIS application provides several key capabilities to the process.

Data input: The Environmental Screening Tool allows those responsible for transportation studies or projects (i.e., FDOT or the MPOs) to input and update information about the proposed actions. The primary data that is input relates to environmental resource information and project planning information. Environmental resource information is provided by the responsible environmental agencies.

Standardized Analyses: Standardized analyses have been developed by environmental resource agencies and are automatically performed by the Environmental Screening Tool. For example, the tool compares the location of proposed projects with known locations of environmentally sensitive resources. Where possible, quantitative information is provided to the user of the tool (e.g., how many acres of wetland could possibly be affected?) Data can be displayed in tabular form or in various graphical forms. The environmental resource agency representative to the ETDM process is notified when new data is received from a project sponsor. The agency is then given 45 days to conduct any direct, secondary, or cumulative impact analyses on the resource for which it is responsible.

Summary of Comments: The Environmental Screening Tool collects the comments from ETDM participants and provides a summary of all agency comments and recommendations. In particular, agency comments associated with key issues are highlighted, especially those relating to the purpose and need statement, the degree of impact of the proposed action, project scoping recommendations (including recommendations for additional technical studies), and a running summary of comments received at public meetings during the project development process.

Read-Only Public Access: The general public is granted general access to only some components of the data base. Accessible information includes such things as project

use data to determine what these effects will likely be in major transportation corridors (*84*).

- Stormwater Management: The State Highway Administration's (SHA) storm water management program is one of the first and most comprehensive efforts of any highway agency in the country. To prevent the adverse effects of storm water runoff, the state has developed 14 performance standards for development sites.
- Erosion and Sediment Control: To protect the Chesapeake Bay, Maryland has enacted sediment control requirements for all construction projects. The SHA's sediment control program has been adopted by many state DOTs.
- Stream Restoration: The SHA engages in watershed planning with the U.S. Corps of Engineers, local jurisdictions, and MPOs on a project-by-project basis. Detailed technical analyses are performed to support watershed planning. In the last decade, there has been a strong national emphasis on restoring impacted or degraded streams using *natural channel design*. The SHA has used this technique extensively.
- Parkland and Forest Conservation: The SHA has worked closely with conservation agencies and groups to develop procedures for environmentally sensitive design and construction. As part of the design process, for example, consideration is given to saving trees that are designated as "specimen" or "significant". Road alignments have been shifted to avoid such trees in several cases.
- Cultural Resources Program: The SHA has a staff of professional architectural historians to ensure that historical resources are considered during the planning and design process for proposed highway projects. The SHA is in the process of developing a Preservation Plan for Historic Highway Bridges to ensure the continued effective use of historic bridges.
- Archaeological Resource Protection: Similar to cultural resources, the SHA employs professional archaeologists to ensure that archaeological resources are considered during the planning and deign process for proposed highway projects. Working in close coordination with architectural historians, SHA's archeologists perform assessments and field studies for several hundred projects each year ranging in size and scope from minor traffic management and control studies to large capacity improvement projects. From 1995 to 1999 for example, SHA archaeologists performed 1750 assessments.
- Aesthetics: The SHA is involved in several beautification initiatives. A wildflower program was introduced in 1991 when SHA adopted a reduced mowing policy to encourage the growth of native wildflowers. SHA has also initiated an extensive urban highway reconstruction program, referred to as streetscapes. Projects under this program are conducted in partnership with local communities and include enhanced amenities as sidewalks, landscaping, drainage improvement and traffic management.
- Wetlands: For each highway project in project development, the SHA develops an extensive inventory of natural resources within the study corridor including all wetlands and waterways. The SHA attempts to select the roadway alternative having the least impact on these resources. While in the past, it was common to see ten acres or more of wetlands impacted by a typical highway project, in the

identified the most critical parts of the desert that should be targeted for historic preservation.

Mountain parks have been one of the most important natural resources in the Pima County region. Since 1998, when the conservation plan was first proposed, over 135,000 acres of Bureau of Land Management land has been conserved. The plan identifies potential locations for further conservation efforts.

Riparian (or water) resources are considered the most threatened and vulnerable by the Conservation Plan. The threat includes not only contamination and draw downs of surface waters, but also the lowering of groundwater levels. The plan identifies opportunities where riparian systems can be enhanced and preserved to not only provide water, but also to secure future recreational and park lands.

Critical and sensitive habitats and biological corridors identified in the plan supported 39 species that needed protection. The key to the analysis was the importance of interconnectivity of the habitats that supported these species. The multi-species conservation plan has become a very important point of departure for the development of the county's comprehensive plan, and, in particular, for identifying the areas where development should be avoided.

With a determination of the acreage necessary to stabilize endangered species, along with targeted historic and cultural reserves, Pima County planners are able to identify Environmentally Sensitive Lands (ESL) that will be protected from development pressures. In addition, guidelines have been developed that provide road designers with strategies to minimize impacts to the environment along designated Environmentally Sensitive Roadways (ESR). Figure 20 illustrates the approach that was taken by Pima County planning staff in conducting the resource analysis for the Sonoran Desert.

Figure 20 about here

San Francisco Bay Area: The Metropolitan Transportation Commission (MTC) has an active program of initiatives and planning efforts aimed at providing more environmentally sustainable development and transportation system performance in the region. Some of the more innovative efforts include the following.

Addressing Equity in Transportation Planning and Service Provision--Many of the programs in the regional transportation plan (RTP) focus on equitable access to transportation services for low-income persons, elderly persons and persons with disabilities. The RTP is subject to an environmental justice (EJ) analysis to assess the distributive impacts of the plan. Equity analysis for the RTP includes an explicit evaluation of the benefits and burdens of the transportation plan on minority and low-income communities. Other MTC efforts on this topic include the development of transportation solutions for those transitioning from welfare to work, the Transportation for Livable Communities Fund that helps revitalize some of the region's most disadvantaged communities, the Low Income Flexible Transportation program, and other efforts to improve the availability and affordability of transportation options.

As part of its equity review, the RTP defines a Lifeline Transit Network, including transit routes, service levels and costs. The system addresses both spatial and temporal service gaps in providing low income and minority populations with access to major services at a reasonable level of service. The MTC also performs project level EJ analysis.

Wisconsin Department of Transportation: The system-plan environmental evaluation (SEE) required by Wisconsin state law and implemented by a state administrative rule is one of the most demanding of such legal mandates in the U.S. As seen in Chapter 3, the Rule that has implemented the law was very specific in the types of impacts that were to be part of an SEE analysis. There was thus little doubt among WisDOT officials about the type of information that was necessary for the SEE analysis, but it was not clear what types of tools and what level of sophistication would be needed to satisfy legal requirements.

The first step in the SEE approach was to develop a screening tool to determine whether a system-plan environmental evaluation was necessary. For the most recent plan evaluated with an SEE, the Wisconsin State Highway Plan, the types of environmental criteria considered for each of the system alternatives included: air quality, energy consumption, sensitive land and water resources, indirect land use impacts, economic development consequences, and community and neighborhood impacts. For each of the impact categories, the SEE analysis provided a description of the types of mitigation that would likely be implemented for the different projects and impacts being considered. In each case, WisDOT experience with each mitigation strategy was highlighted. Figure 21 shows the screening tool used to determine whether an SEE is necessary.

Figure 21 about here

Because of the mandate to conduct system-plan environmental evaluations, WisDOT prepared a reference manual that outlined the tools and methods that were appropriate for the level of analysis that was to occur in systems planning. Unlike other states, WisDOT has a fairly sophisticated statewide modeling capability. Freight flow projections are based on national databases and a statewide model allows WisDOT officials to forecast traffic volumes. In addition, geographic information system (GIS) data for agricultural land, endangered resources, and water resources have been an important component of the systems-level environmental evaluation.

The key approaches and concepts recommended in this reference manual is described briefly below.

Key Concepts

- System-level impacts should consider

  --cumulative impacts, that is, impacts that build upon one another)

  --secondary impacts, that is, impacts that occur after the immediate influence of a project or program

  --synergistic effects, that is, the impacts of one group of actions reinforce the effects of another set of actions

  --mitigating effects, that is, the strategies that can be undertaken to offset the effects of another set of actions

- Impact assessment at the systems level should include a comparative assessment of three factors: type of action category, scale of action, and location.
- The types of impacts that potentially should be reported include direct, indirect, and secondary impacts.

- An evaluation matrix should be used to present the overall results of the comparative analysis. This matrix would most likely be in narrative form.

The impacts considered, and the manner in which they were analyzed, are as follows:

Traffic Congestion Impacts

Air quality – The latest MOBILE model emission factors were multiplied by the vehicle miles traveled (VMT) for each alternative to arrive at an estimate of total emissions. The analysis showed that implementation of the recommended plan would result in 14% lower emission levels than in 2000.

Energy consumption – 1997 miles per gallon data were applied to 2020 annual VMT classified by various levels of congestion, and by functional classification in both urban and rural areas. Fuel consumption under the recommended plan was slightly less than the base case.

Direct Land Use Impacts

Sensitive land – Three types of sensitive land were identified: agricultural land, habitat fragmentation, and endangered resources. The impact on agricultural land was estimated as the number of acres taken to build highways. The number of lane-miles added and potential new bypasses constructed were used as a surrogate for habitat fragmentation. The impact on endangered resources was measured by using National Heritage Inventory data to determine how many sites were within one mile of a potential highway improvement. This analysis showed that the recommended plan could potentially impact endangered resources about 700 times compared to 250 times for the base case.

Sensitive water -- Two types of water quality impacts were reported: construction-related erosion/runoff and post-construction storm water runoff. The measures used for construction-related water issues included the number of lane-miles added, the number of bridges replaced, the number of new bridges constructed, and the number of wetlands affected. The evaluation showed that the recommended plan would require two-and-one-half times as many lane miles as the base case, the replacement of 337 bridges over water, and the construction of 217 new bridges over water (in comparison, the base case would replace 45 fewer bridges and would construct 76 new bridges). The recommended plan would also convert 900 to 1,100 acres of wetlands.

Post-construction storm water runoff was measured with the additional new lane-miles variable, thus indicating a two-and-one-half times impact over the base case.

Indirect Land Use Impacts

Indirect land use impacts reflect the potential of new transportation capacity to either induce new development or alter the existing pattern of development. As noted in the report, quantifying this impact, especially at the systems level, is very difficult. The recommended plan includes quantitative, comparative statements on potential secondary land use impacts by citing miles of new roads by location and type, and by identifying general impacts that may occur. Table 16 shows the qualitative information that was presented in the Plan to illustrate the different types of land use impacts that may occur by location and type of road investment.

Table 16 about here

- Geographic information systems (GIS) and spatial-statistical analysis for environmental justice analysis;
- Resident or neighborhood surveys for studies on neighborhood cohesion;
- Risk models for analyzing the settlement of displaced populations;
- Regression models, spatial interaction and entropy-maximizing models, Markov models and simulation models for modeling pedestrian movement;
- Photomontage techniques for visual impact assessment involving the superimposition of images of transportation system changes onto an existing street scene;
- Noise prediction models such as STAMINA, the Federal Highway Administration s noise prediction software, and
- Simulation models to estimate economic development impacts of transportation investments.

2) Neighborhood surveys are one of the most promising approaches for estimating the social effects of transportation projects, allowing planners to deduce the attributes of neighborhoods that are valued by residents in order to consider these attributes when formulating transportation system changes and mitigating their negative impacts.

3) While many of the methods, tools and techniques in use have been applied to study current circumstances, few have been applied to predict the impact of a planned change.

4) Methods, tools and techniques for estimating economic effects are substantially more advanced than is generally true for techniques to measure social effects.

5) State DOTs, in general, are much more likely to conduct social and economic impact analyses with their own staff than are MPOs. MPOs are more likely to engage the services of consultants for this type of assessment.

The results of the literature review and case studies indicate that geographic information systems (GIS) are becoming a standard tool for environmental assessment in transportation planning. This tool is particularly useful for spatial analysis of equity issues. For example, the Toledo Metropolitan Area Council of Governments (TMACOG), Bay Area Metropolitan Transportation Commission (MTC), Delaware Regional Valley Planning Council, LA Southern Californian Association of Governments, North Carolina DOT, Georgia DOT and the U.S. Army all use GIS to incorporate equity issues into planning (see for example, *72, 91, 92, 93* and *94*).

In addition, several agencies are using GIS as a tool to catalogue environmental resources and evaluate the impact of various project, corridor or plan alternatives on environmental resources. Agencies such as the Oregon DOT and Caltrans are developing GIS capabilities for "fatal flaw" and scenario analyses. Mn/DOT has initiated the development of a GIS to track and analyze impacts of proposed alternatives on the state's archeological resources, and as was seen in the previous section, the Florida Department of Transportation (FDOT) has developed a GIS for environmental assessments applicable at the planning and project development levels.

problem identification (accident sites, congested areas, geometric deficiencies etc.), existing conditions (facility location, soil types, etc.), constraints and impacts (historic resources, parks, wetlands etc.) and various other data are displayed on large screens in a group setting allowing stakeholders to engage in collaborative alternatives analysis at the planning or project level.

Document and process management tools include electronic reporting, web GIS, multimedia and administrative record, document and outcome tracking software. A multimedia administrative record is a permanent and easy-to-navigate electronic file that provides a record of the decision process and includes all official documents that are necessary to explain and record important decisions. These tools make use of electronic publishing and database features to communicate project information through electronic and online documents; record key steps in the project development process; and track project outcomes, mitigation, and completion of required documents. Examples of applications include "virtual" environmental assessments and environmental impact statements as well as other planning documents, designed as easy-to-use multimedia products that are visually interesting, engaging and informative.

Facility information management systems (FIMS) are a comprehensive transportation and environmental inventory containing the entire set of environmental (e.g., thematic) data that comprise, support, affect, or are impacted by transportation systems. In addition to transportation infrastructure (e.g., travelways, pavements, bridges, and terminals), the inventory data includes travel and commodity movements as well as other natural and cultural feature information necessary to the transportation facilities' life cycle functions. The data contained in FIMS ranges from historical to current to near real-time conditions. The FIMS can be thought of as a one-stop data warehouse containing or providing access to all information used throughout the planning, project development and systems operations phases. In addition to containing all in-house transportation and environmental feature data, FIMS must also provide access to data warehouses containing natural, constructed, and other social environmental data maintained by other agencies.

(2) *Remote sensing* provides digital information on land and earth features that can be combined with spectral analysis and GIS modeling to create a powerful screening tool for transportation corridor or regional evaluation. Remote sensing can quickly and cost-effectively categorize and quantify land cover types (wetlands, crop lands, forested lands, etc.). When combined with topographic, environmental constraint, geological, and planimetric information, this data also can be used for quantitative description and evaluation of plan or project alternatives. Combining remote sensing and GIS capabilities offers the ability to present plan or project scenarios in a three-dimensional environment, providing decision makers and the public with a clear picture of potential impacts. Examples of remote sensing technologies discussed in the NCHRP 25-22 report include: 1) terrestrial and airborne lidar, 2) digital aerial photography and photogrammetry, 3) radar imaging and mapping and ground-penetrating radar; and 4) multi-spectral and hyper-spectral satellite and airborne imaging.

(3) Transportation impact modeling tools/technologies refer to the numerous models used to evaluate potential environmental effects of transportation projects such as air quality, noise, water quality and biological resources. Illustrative models include biological resource models such as Wetland Environmental Tools (WET) for planning and ranking of wetland areas; and Habitat Evaluation Procedures (HEP) for habitat-based impact assessment and resource management in both terrestrial and aquatic environments. Examples of water resources models include the Stormwater Management Model (SWMM), a computer simulation model for the analysis of quality and quantity problems

Expert systems generally consist of a set of rules and user-supplied data that interact through an inference engine, an expert, or knowledge-based system able to derive or deduce new facts or data from existing facts and conditions. Expert systems have become more widely available, allowing users to define the database and rule base without using artificial intelligence programming languages. Less often, individual organizations will create their own expert systems for specific purposes.

(4) Decision analysis tools can help transportation agency staff define problems, manage expectations, identify an appropriate range of alternatives, clarify information needs, identify and quantify uncertainties and their impacts on the decision, avoid decision traps in evaluating alternatives, and ensure meaningful involvement of stakeholders. The application of decision science methodologies is advantageous for technical analysis as well as public outreach processes and generally assists in creating a credible and auditable decision process. Examples of these technologies include multi- attribute utility analysis, prioritization, risk analysis and optimization.

Multiple attribute utility analysis methods are used to evaluate and select alternatives based upon multiple attributes or criteria. This approach allows for the management of multiple objectives, the quantification of objectives, and the illustration of trade-offs. This approach is typically applied when multiple stakeholders concerned about multiple issues are required to select one alternative. The Toledo Metropolitan Area Council of Governments (TMACOG), as described in Chapter 3, uses a formal application of a multi-attribute framework for selecting among various plan alternatives (or project clusters).

Prioritization methods rank competing alternatives based upon objective criteria and specified constraints. This method is primarily used to prioritize multiple activities or projects and to illustrate explicitly that the maximum benefit is being derived from the investment.

Risk analysis is an approach designed to determine how risk contributes to decision success and how to manage that risk. An example of an application of this technology is deciding when to proceed with a project to minimize the cost, risk, and uncertainty related to a parallel project.

Optimization methods involve the development of an optimal system solution based on the comparison of multiple variables. This technology may be applied to determine traffic-timing elements at a complex intersection.

(5) Computer-based simulation creates a 3-D, motion-based visual environment. This 3-D environment relies on three spatial axes (corresponding to the dimensions of length, height, and width) to create a spatial scene. The image is visually created in a computer graphic format, including the capability of incorporating motion as part of the scene generation. Other senses (particularly sound) are beginning to be synchronized to such simulations. Four-dimensional simulation adds the variable of time to 3-D simulation. The time variable permits heuristic examination of spatial change. Real-time analysis provides insights for traffic management, safety analysis, environmental change, construction management, and master planning (e.g., short range versus long range). Applications for design of transportation alignments in a "virtual reality" setting incorporating a full set of environmental constraints are likely the next steps in the evolution of this technology. Time-based visual simulation is not as advanced as 3-D simulation, and consequently it is less common.

Another important research effort on environmental information management was recently completed as NCHRP 25-23: *Environmental Information Management and*

tools can be quite sophisticated and comprehensive. But as was seen in other case studies, simpler tools are being used as well.

Such a range of capability was found in a recent survey of 11 strategic environmental assessments (SEAs) that covered a diverse set of topics--road, rail, waste management, electricity supply, gas development, underground infrastructure, an ecological district and a political program (*96*). In addition, a variety of countries were represented in the survey, including Germany, the United Kingdom, the Netherlands, New Zealand and China. Table 17 shows the variety of methods used for such assessments.

As indicated by the survey undertaken for this project, very few agencies considered inadequate analysis tools and methods as a substantial constraint in their efforts to consider environmental factors in transportation planning. Where agencies have determined a need for new or different tools, resources have usually been allocated to their development. Examples include Caltrans, FDOT and ODOT initiatives to develop GISs to catalogue their environmental resources and to analyze the impacts of various plan and project alternatives on these resources. Other notable examples are WSDOT's development of an environmental benefit cost analysis tool, and the San Francisco Bay Area MTC's development of GIS capabilities for environmental justice analysis. In this regard, the dissemination of practical applications of emerging tools could be useful to agencies that have identified analytical needs and are in the process of identifying options for developing or acquiring capabilities to meet these needs.

Beyond agency needs, there could also be value in broadly disseminating useful applications of emerging methodologies to showcase how tools and methods could be integrated into existing planning processes. For example, the use of integrated models, especially land use-transportation models, could find a role in various agencies that have begun to see a need for promoting transportation-efficient land use decisions, but have which have not yet articulated analysis needs to support this effort.

Another possible example is the dissemination of GIS applications for inventorying and conducting systems level environmental assessments. A major prerequisite for moving environmental considerations early into the planning process is knowing where sensitive environmental resource areas are located. GIS platforms are ideally suited to providing this type of information. It is not surprising that those states that have progressed the furthest in systems-level environmental assessment have been those that made early investment in GIS technologies. However, as was also seen in some of these cases, such as in Florida and Wisconsin, determining possible impacts at such broad scales of application often relies on subjective expertise.

Tools and methods do not always have to result in quantitative output. For example, Table 18 offers different, non-computer-oriented approaches to providing important information to the early stages of the planning and decision-making processes.

Table 18 about here

Given the range in tools and methods that can be used in environmental analysis, a regular synthesis on such methods and tools as well as their practical applications would be very helpful in ensuring that transportation agencies would have the best capability for addressing different environmental issues. Forums for sharing state DOT and MPO experiences with the use of various methods and tools would also be useful in this regard.

identification by transportation and environmental participants of the benefits of moving environmental considerations early in the planning process is a prerequisite for successfully doing so.

Figure 21 and Table 19 about here

The concepts illustrated in Figure 21 and described in Table 19 can act as a check list for agencies desiring to incorporate environmental considerations into agency operations, especially into the systems planning process. For example, the following questions could serve as an assessment or audit tool for determining where additional steps were needed to implement an effective environmental stewardship program.

1. Has your agency included concern for the environment in its mission or vision statement? Have guidelines or standard operating procedures been developed to disseminate this vision throughout the agency?
2. Has the transportation planning process included environmental issues in the goals and objectives statement?
3. If your agency has defined a set of performance measures relating to system or agency performance, are environmental measures a part of this list?
4. Does your agency collect data on environmental conditions on a systematic basis? Are sufficient resources available for continuing such data collection?
5. Has your state or region developed an inventory of sensitive environmental resources? If so, is this inventory used for planning or project development purposes, in particular, in efforts to avoid or minimize environmental impacts caused by project implementation?
6. Does your state or metropolitan area's transportation planning process provide sufficient information that can be used in a determination of "need and purpose" for subsequent project development?
7. Does your agency systematically consider environmental factors in the definition of alternatives? Is at least one of the alternatives designed to minimize environmental impacts to the extent possible?
8. Has your agency defined project alternatives that both provide transportation benefits and enhance environmental quality? Does your agency actively pursue such project alternatives?
9. Do the criteria used to evaluate alternatives include the range of environmental concerns that are of most interest to the community and to environmental stakeholders?
10. Does your state or metropolitan transportation plan explicitly consider environmental factors in its description of desired future investments?
11. Has your agency entered into partnership arrangements with environmental resource agencies and environmental stakeholders in order to develop common understandings of how environmental factors will be considered in system planning and project development?
12. Do your agency's public involvement and outreach efforts specifically target environmental quality and its relationship to transportation system performance as an issue brought to public attention?

The concept of ecological carrying capacity, which relates to this idea of an environmental alternative, is one that has been receiving increased attention in the science literature. The Cape Cod, Lake Tahoe, North Carolina, Pima County, AZ and Riverside County, CA cases illustrated the use of this concept. There is little doubt among scientists that urban development and other human activities affect the health of often-sensitive ecosystems. As urbanization continues with substantial increases in population expected to live in metropolitan areas it seems reasonable to assume that this additional population will carry with it increasing burdens on the ecological systems that exist in urban areas.

State and MPO officials expect increasing attention to the types of environmental impacts that are best addressed at a systems level. The survey of state and MPO officials asked which environmental factors would most likely be more important 10 years from now in connection to transportation systems planning. Interestingly, the types of factors having the largest jump in importance were those best analyzed at the systems level. For example, state DOT officials suggested that the biggest increase would be for cultural, historic, energy, water quality, farmland conversion, and human health. The results from the MPO survey identified the following: energy, water quantity, water quality, aesthetics, storm water runoff, farmland conversion, and noise. Except for aesthetics and noise, all of these factors are best handled at a scale of analysis much greater than at the project level.

A small number of states and metropolitan areas have taken major steps in integrating environmental factors into transportation systems planning. Most states and MPOs have much experience with considering environmental factors in project-level planning. Only a few examples were found where transportation agencies were incorporating environmental concerns into systems planning. The Tahoe Regional Planning Agency; Cape Cod Commission; Pima County, AZ; Riverside County, Ca; and the Florida DOT were the most advanced examples of a comprehensive approach to doing so. In the first four cases, a fragile ecology provided the impetus for public intervention in the land development market and for a more targeted approach toward the provision of infrastructure. In the Florida DOT example, top management leadership provided the motivation to implement arguably the most advanced transportation/environmental decision support system in the U.S.

The New York State DOT has taken major steps to inculcating an environmental ethic in all of its activities. It was not listed with the above five simply because it does not have a systems planning process as the others. However, such an organizational strategy does represent an important step in the evolution toward a more comprehensive approach to linking environment and transportation decision making.

Importantly, one of the issues that must be addressed in better involving environmental resource agencies in system planning efforts is how to motivate such participation? Many states have provided resources to such agencies to support their participation, although this has been primarily at the permit review level. Getting agencies to participate in system planning efforts will require at a minimum a top management commitment to participate, an understanding (usually codified in a memorandum of understanding) of the roles that each participant will play, and as noted above, often the commitment of resources.

The concept of assessing the level of environmental sensitivity of habitats, ecosystems and watersheds has been used by several planning and transportation agencies as a starting point for more comprehensive community planning. Some of the more comprehensive efforts at integrating environmental factors into community and infrastructure planning have started with a fairly detailed examination of environmental resources. Pima County, AZ and Riverside County, CA undertook extensive multi-species habitat studies to identify areas that needed to be preserved. The Cape Cod and North Carolina DOT cases provided examples of a much broader assessment of ecosystem preservation, not simply habitat protection. Each of these efforts was part of a much broader community development planning effort.

Some planning efforts are defining transportation plan alternatives that focus on minimizing environmental impacts. Defining alternatives is an important step in transportation planning. One of the interesting aspects of those planning processes that have seriously considered environmental factors in systems planning is the definition of plan alternatives or scenarios that results in infrastructure policies and investment decisions that purposely avoid or minimize the negative impacts on environmental resources. Examples of this were found in Cape Cod, Lake Tahoe and Atlanta.

The use of scenarios in the formative stages of transportation systems planning is an important approach for showing the significance environmental factors in planning for the future. This approach not only provides important information on the likely environmental impacts of transportation investment, but it represents a learning and education process where participants in this process gain an understanding of how important ecological health is to a community. This learning experience has been one of the benefits pointed to by participants in the few cases where this approach has been used.

Successful consideration of environmental factors in system planning will require substantive public involvement and participation of environmental stakeholders. Efforts to advance environmental considerations early into systems planning will most likely require more extensive public involvement and the presentation of information in ways that makes such considerations understandable. Environmental quality, especially at the local level, is one of the most important issues for the public as evidenced in opinion surveys. Serious attention given to environmental factors in systems planning could very well mobilize many of the groups that traditionally become involved during project development. The approach toward planning might very well have to be different in cases where environmental assessment is now being conducted on system plans. For example, one might envision a public meeting for a transportation systems plan starting with general environmental data, maps of environmentally sensitive or community sensitive areas, and projections of the environmental health of the region. In addition, in the two cases where substantive environmental assessment was undertaken, Pima County, AZ and Riverside County, CA, environmental scientists were part of the habitat screening and evaluation process. In both cases, representatives of this community served on the study steering committee.

Moving environmental considerations early in the planning process very much requires the participation of environmental resource agencies in these early stages as well. The Wisconsin DOT example of undertaking an environmental assessment of systems plans suggests that, in fact, one of the benefits of doing so is getting environmental resource agencies involved. Other state DOT examples can be found in

management oversight, and improved project information systems are being viewed as the most appropriate ways of dealing with this issue.

Other types of strategies are being considered by implementing agencies to reduce the amount of time that projects spend in the project development process due to environmental reviews. These include: listing certain categories of projects in a programmatic permit approval, parallel processing of NEPA and engineering design, funding environmental resource staff to work on transportation projects, and establishing interagency agreements that define the respective roles of the agencies participating in the project development process.

A context sensitive solutions (CSS) approach to project development is viewed by state DOTs and MPOs as a "win-win" situation. Although not the same as considering environmental factors early in systems planning, the concept of context sensitive solutions as an approach to project development was a noticeable policy directive in all of the state DOTs visited, and was being encouraged by MPO officials as well. In some ways, CSS is being viewed in similar terms as incorporating environmental considerations early in systems planning. This approach to project development calls for early and continual involvement of community stakeholders, a mutual definition of problems, and a collaborative development of solutions. This is, in essence, the concept that was being explored in this research project only applied to systems planning.

The response to CSS has been very positive. The projects that have been completed in the states visited were pointed to with pride by all involved as showing what can be accomplished when everyone works together. The image of the DOT was enhanced. Community support for projects was at much higher levels than for previous comparable projects. And engineers developed confidence in their abilities to meet the mobility needs of the community, while providing a creative design that received community accolades.

The concept of CSS as an approach to project development can be linked closely with the early consideration of environmental factors in system planning. Not only can system planning identify areas where CSS might be very appropriate (e.g., sensitive or historic areas), but the system planning process can also identify key participants in the process that would likely play important roles as the project came closer to reality.

INSTITUTIONAL STRATEGIES TO IMPLEMENT CHANGE

Each of the successful efforts identified in this research of incorporating environmental factors into the policy, planning or project development activities of a transportation agency was implemented with strategic deliberation and consideration of how such a change could be best carried out in the organization. Although each of the case studies presented different aspects of incorporating environmental factors into organizational procedures or agency culture, the strategies usually had many common characteristics. These characteristics included:

Top Management Support: In many cases, requirements of state law provided an incentive for state transportation officials to consider environmental factors during systems planning. However, even in such cases, the level of commitment to this concept very much depended on the extent to which the Secretary, Commissioner or Chief Engineer held a strong positive position on the policy. This continuing top management interest and support provided the motivation to continue facing the organizational barriers that often

the organization. This was certainly an important part of the strategy in the New York State DOT for institutionalizing its Environmental Initiative in all parts of the organization.

Resources: The most important obstacle cited by DOT and MPO officials as hindering the incorporation of environmental factors into transportation planning was "competing objectives that detract from environmental considerations". In one sense, this could be interpreted as a resource allocation problem, i.e., a lack of sufficient resources to consider environmental factors in planning. If a state perceives that an environmental problem is serious or important enough -- such as the deterioration of the Chesapeake Bay in the case of Maryland -- it will pass the laws necessary to address the problem. Enabling legislation for environmental analysis is probably the most important motivator for transportation agencies in considering environmental factors in transportation planning.

Many of the case studies in this research indicate that the early consideration of environmental factors can be time- and resource-consuming. Transportation agency staff must often spend considerable time with environmental resource agencies explaining the rationale for a particular project and the actions to be taken by the DOT in environmental mitigation. The expectation is that the extra time spent early in the process will result in greater progress in moving the project through the project development process when it reaches that stage.

The case studies illustrated the level of support that was deemed necessary to assure success. In New York, the DOT hired environmental managers for every district in the state to act as catalysts for the Environmental Initiative. In Minnesota, the DOT dedicated full time staff to the effort at changing the internal procedures of the organization. In Florida, millions of dollars have been spent on the environmental screening tool that serves as the foundation of the ETDM process. All of these efforts were critical to the success of the initiatives in each agency.

External Implementation Strategies: Much of the success in considering environmental factors in systems planning relies on establishing agreements with environmental resource agencies that articulate the respective roles of each actor in the planning and project development process. The usual means of doing this is through memoranda of understanding, or in the case of Florida DOT's ETDM process, agency operating agreements.

An example of such an agreement can be found in California. California's state transportation agencies have been national leaders in establishing formal partnership relationships with environmental resource agencies. California's Business, Transportation and Housing Agency has recently entered into a partnership agreement with the California Environmental Protection Agency (Cal/EPA) and the Resources Agency (RA) to identify program areas in which additional cooperation will result in a more successful integration of statewide mobility goals with environmental protection. This Tri-Agency Partnership, which realigns institutional relationships to improve the scope and pace at which environmental considerations are incorporated into transportation planning, identifies two purposes for the partnership. First, the Partnership is designed to foster cooperative interactions among the three agencies. Second, the result of this cooperation is the timely planning and implementation of transportation projects that protect or restore environmental resources.

The specific goals of this Partnership included:

- Identifying and sharing information on transportation and environmental priorities.

- The reduction in the potential for delays in project approval due to mitigation concurrence and permit processing (*98*).

Partnership Benefits: Environmental resource agencies often hesitate to participate in a process where environmental factors are considered early in system planning. This hesitation is primarily caused by a concern that such early participation could be construed as approval of a project long before some of the specific impacts are known. State transportation agencies that have successfully formed partnerships with their respective resource agencies have done so by promising to consider seriously the likely impact of transportation projects on the environmental factor at issue, and often supporting environmental staff review of the agency's projects. Many states, e.g., Pennsylvania, New Jersey, Maryland, and California have agreed to fund environmental resource agency staff for their efforts at project review.

For example, Caltrans signed a memorandum of agreement with the state's Department of Fish and Game in 1990 concerning expedited review of transportation projects. The intent of this agreement was "to 1) foster the early consideration of biological impacts in transportation system planning, 2) provide continuous coordination and early consultation between the transportation agencies and the resource protection agencies, 3) replace valuable habitat unavoidably lost through the creation of high quality habitat prior to impact, and 4) exercise creativity within an atmosphere of mutual respect"(*98*). The inset on the next page shows the typical types of actions that resource and transportation agencies agree to in such arrangements.

Appendix D presents and example of a memorandum of understanding among transportation and environmental resource agencies in Minnesota.

FUTURE RESEARCH

In many ways, this research project suggests a rethinking of the way systems planning is conducted in the U.S. At the very least, it suggests a different mindset among the majority of transportation planners and engineers of how environmental factors should be considered during the planning process. It also focuses attention on the types of environmental issues that will likely be faced in the future, and thus the types of expertise that will be necessary if these issues are to be dealt with in a serious way.

The ability of transportation agencies to adapt to a new approach toward planning will to a large extent depend on their understanding of the importance of the issues and on how the system planning process can best incorporate these concerns from a process and technical point of view. The following proposed research topics are designed to get the transportation profession to this point.

Understanding the systems effects of ecosystems, human development, and transportation investment: Scientists have been focusing on ecosystem health for many decades and are just now beginning to understand many of the complexities that characterize ecosystem health. Some attention has been given to the negative impacts of human activity on ecosystems, although most of this research has been at the macro level (e.g., number of wetlands and thus wetland functionality lost). Very little attention has been given to the relationship between ecosystem health and transportation investment. Such research would examine the basic science involved with this relationship and develop methods and tools that can be used to investigate ways of reducing the influence

PRINCIPLES OF AGREEMENT IN A MEMORANDUM OF UNDERSTANDING BETWEEN CALTRANS AND THE STATE'S DEPARTMENT OF FISH AND GAME

The Resource Agencies Agree to:

- Commit or redirect staff and resources to accomplish early planning and coordination goals;
- Assist Caltrans in evaluating impacts of future transportation improvement projects during the early planning stages and respond to requests for information, recommendations and coordination in a timely manner;
- Identify the natural resources of concern within the area of potential impact and recommend measures to avoid, or minimize and compensate, impacts to natural resources;
- Explore all appropriate mitigation and enhancement options consistent with the policies and guidelines of the agencies;
- Assist in developing mitigation proposals that take into account the extent of the project impacts, the affected habitat values, benefits to the ecosystem, cost effectiveness and opportunities for coordinating with other conservation efforts; and
- Consider application of excess compensation for future projects and permit "banking" when an appropriate opportunity exists.

Caltrans and FHWA Agree to:

- Pursue a policy of proactive consideration of environmental issues and concerns in which the sequencing principles of avoidance, minimization, and compensation are applied to natural resources;
- Incorporate all feasible and practical features of project design which avoid and minimize adverse project impacts before employing compensation measures;
- Where mitigation is required, achieve on-site and in-kind compensation whenever feasible and recommended by resource agencies;
- Implement compensation in advance of project impacts whenever feasible and appropriate;
- Explore opportunities for natural resource enhancement during project development;
- Keep all agencies updated on planning and project development activities;
- Provide for monitoring and periodic evaluation to determine if modifications are necessary to ensure that project compensation measures meet the overall planned mitigation goal and permit requirements;
- In addition, Caltrans agrees to provide for the sustained maintenance and operation of the compensation sites and habitat values sufficient to offset the unavoidable losses; and
- To the extent that such activities are not part of regularly funded planning assistance and review, fund on a reimbursable basis as need and mutually agreeable, the resource agencies to provide technical assistance, technical studies, and expedited review as part of early mitigation planning.

Source: (97)

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Table 2: Traditional Transportation Planning Compared to Sustainable Development-Orientation

Characteristic	Traditional Process	Sustainable Development-Oriented
Scale	• Regional and network level	• Local, state, national, and global perspective
Underlying "Science"	• Traffic flow theory • Network analysis • Travel behavior	• Ecology • Systems theory
Focus of Planning and Investment	• Accommodate travel demand • Promote economic development • Enhance system safety • Catch-up to sprawl	• Efficient use/management of existing infrastructure • Provide transportation capacity where appropriate (from ecology perspective) • Redevelopment of development sites • Reduce demand for single occupant vehicles • Reduce material consumption and throughput
Government Economic Policies	• Promote new development on new land • Economic policy focuses on productivity • Do not include secondary and cumulative impacts in policy analysis	• Promote reuse and infill development • Economic policy fully integrated with environmental policy • Secondary and cumulative impacts are part of policy decision analysis
Timeframe	• 15-20 years planning • 4-8 years for decision-maker interest (elections)	• Short (1 to 4 years) • Medium (4 to 12 years) • Long (12 to --- years)
Focus of Technical Analysis	• Trip-making and system characteristics between origins and destinations • Air quality conformity • Benefits defined in economic terms	• Relationships between transportation, ecosystem, land use, economic development and community social health • Secondary and cumulative impacts
Role of Technology	• Promote individual mobility • Meet government-mandated performance thresholds to minimize negative impacts • Improve system operations	• Travel substitution and more options • Benign technology • Total life cycle perspective to determine true costs • More efficient use of existing system
Land Use	• Considered as a given based on zoning that accommodates autos • Land use and transportation planning separated	• Integral part of solutions set for providing mobility and sustainable community development • Infrastructure funding tied to sound land use planning • Increased density and preservation of open space/natural resources
Pricing	• Subsidies to transportation users • True "costs" to society not reflected in price to travel	• Societal cost pricing including environmental cost accounting • Value, that is, transportation priced as utility
Types of Issues	• Congestion • Mobility and accessibility • Environmental impact at macroscale • Economic development • Little concern for secondary/cumulative impacts • Social equity (increasingly)	• Global warming and greenhouse gases • Biodiversity and economic development • Community quality of life • Energy consumption • Social equity
Types of Strategies	• System expansion/safety • Efficiency improvements • Traffic management • Demand management (from perspective of system operating more smoothly) • Intelligent transportation systems	• Maintenance of existing system • Traffic calming and urban design • Multimodal/intermodal • Transportation-land use integration • Demand management (from perspective of reducing demand)/non-motorized transportation • Education

Note: Characteristics for sustainable development-oriented process synthesized from (*15, 19, 35*)

Table 4: OECD's Framework of Sustainability Indicators

Sectoral Trends of Environmental Significance	
1. *Overall Traffic Growth and Mode Split* • Passenger traffic trends by mode (private cars, buses and coaches, railways, air) in passenger-kms • Freight traffic trends in vehicle-kms/ Road traffic trends in vehicle-kms • Trends of airport traffic, number of movements • Trends in tonnage handling in national harbors	2. *Infrastructure* • Capital expenditure, total and by mode 3. *Vehicles and Mobile Equipment* • Number of road vehicles (autos, commercial vehicles): total, gasoline, diesel, others
Environmental Impact	
1. *Resource Use* • Total final energy consumption of the transport sector (share in total, per capita, by mode) in tones of oil equivalent 2. *Air Pollution* • Transport emissions (CO_2, NOx, VOC, CO, etc) share in total, per capita, by mode) • Emissions per vehicle-km: CO_2, NOx, VOC, CO, etc. 3. *Water Pollution* • Tonnage of oil released through accidents and discharges during current operations	4. *Noise* • Population exposed to noise greater than i65 dB(A) from transport 5. *Waste* • Tonnage of transport-related waste • Tonnage of hazardous waste imported or exported 6. *Risk and Safety* • Number of people killed or injured • Tonne-kms of hazardous materials transported
Economic Considerations	
1. *Environmental Damage* • Environmental pollution damage relating to transport 2. *Environmental Expenditure* • Total expenditures on pollution prevention/clean-up • R&D expenditures on quiet, clean, energy-efficient vehicles • R&D expenditure on clean transport fuels	3. *Taxation and Subsidies* • Direct subsidies • Direct and indirect subsidies • Total economic subsidies • Relative taxation of vehicles and vehicle use 4. *Price Structure* • Trends in gasoline (leaded, unleaded), diesel and other fuel prices and public transport prices in real terms 5. *Trade and Environment* • Indicator not yet developed

Source: (*55*)

Table 6: Mn/DOT Plan Policy Link With Strategic Directions

Strategic Directions	Safeguard What Exists	Make the Network Operate Better	Make Mn/DOT Work Better
Plan Policies	1. Preserve essential elements of existing transportation systems 2. Support land use decisions that preserve mobility and enhance the safety of transportation systems 3. Effectively manage the operation of existing transportation systems to provide maximum service to customers	4. Provide transportation options for people and freight 5. Enhance mobility in interregional transportation corridors linking regional trade centers 6. Enhance mobility within major regional trade centers 7. Ensure the safety and security of the transportation systems and their users	8. Continually improve Mn/DOT's internal management and program delivery 9. Inform and involve all potentially affected stakeholders in transportation plans and investment decision processes 10. Protect the environment and support community values

Source: [*69*]

Table 8: Measures of Environmental Benefit for Lake Tahoe Region

Indicator	Unit of Benefit
Air Quality	
Carbon monoxide	Improved level of service
Ozone	Hydrocarbon, NOx emissions
Particulates	Stationary burning dust control
Visibility	Dust control; SO2 emissions
US 50 traffic volume	Park/U.S. 5 volume reductions
Air quality/Wood smoke	Wood heater emissions/burn time
Vehicle miles traveled	VMT reduced
Atmospheric nutrient loading	NO_3 emission reductions
Fisheries	
Lake habitat	Acres improved
Other habitat	Acres improved
Stream habitat	Miles improved to excellent
Stream habitat	Miles improved to good
Stream habitat	Miles improved to marginal
In-stream flow	Base flow maintained
Noise	
Single event (aircraft)	dBa improved
Single event (other)	dBa improved
Community	CNEL dBa improved
Recreation	
High quality rec experience	Unitless
Multi-use trails	Miles paved
Multi-use trails	Miles unpaved
OHV trails	Miles acquired
Dispersed recreation	Acres acquired
Capacity for general public	Capacity
Winter day use	PAOTs
Summer day use	PAOTs
Overnight use	PAOTs
Soil Conservation/SEZ	
Impervious cover	Square feet of land coverage
Disturbed land	Acres revegetated
Hard coverage	Acres retired
Roadway	Miles obliterated
Soft coverage	Acres retired
Sensitive land	Acres acquired
Naturally-functioning SEZ	Acres restored

TABLE 9: Goals and Objectives for the TMACOG Transportation Plan

Type of Goal	Goal	Supporting Objectives
Primary or driving	1. Our Transportation System must enhance our region's economic competitiveness in the global economy	-Maximize job potential through transportation improvements that support economic development including revitalizing the regional core (Toledo CBD) -Maximize economic efficiency and safety for movement of goods and people -Enhance "connections" into interregional and international transportation systems -Maintain the existing system
	2. Our transportation system must be "an integrated intermodal transportation system"	-Minimize delays for movement of goods and people -Maximize ease of intermodal transfers -Enhance viability of non-highway modes to achieve balanced system and provide for choice of modes for many trips (both freight and passenger)
Filter or screening	3. Our transportation system must be a "sustainable system"	-Minimize negative environmental impacts on open space, natural areas, wetlands, floodplains, etc. -Maximize achievement of long term environmental objectives (e.g., air quality goals, reduction of fossil fuels used)
	4. Our transportation system must "enhance the region's quality of life."	-Fulfill environmental objectives as described in 3 above. -Maximize reasonable access to jobs and services for all citizens of our region without regard to age, income, race or disability especially those in environmental justice target areas. -Helps create safe and pleasant living environments in the region and avoid disproportionate impact on minority and poverty areas targeted for environmental justice issues.

Source: (72)

B. The following area examples of some of the practices and programs that should be considered to improve DOT's current environmental performance:

- Continue to identify improved ways to use deicing materials and abrasives
- Improve efforts to sweep/collect/recycle the roadside abrasives in the spring
- Continue efforts to reduce herbicide use
- Clean up wastes previously generated at DOT projects and facilities
- Encourage and implement transportation demand management (TDM), transportation system management (TSM), and Intelligent Traffic System practices
- Encourage alternatives to single occupant vehicle commuting
- Expand Ozone Alert Day initiatives
- Promote alternative fueled vehicles
- Increase support for mass transit
- Pilot and promote the use of recycled tires in highway embankments, glass, plastics and aggregate in pavements, and plastic, rubber and aggregate in noise walls
- Preserve historic structures
- Promote State bike routes and greenways

C. The following are some examples of technology transfer and data sharing activities with other local, state and federal resource and highway agencies to advance environmental stewardship in the transportation industry:

- Provide and/or participate in joint training
- Share standard details, specifications, and best management practices
- Share guidance manuals and handbooks
- Conduct joint research and share results
- Exchange GIS data sets
- Identify agency points of contact and subject matter experts
- Exchange staff phone numbers and e-mail addresses
- Participate and present at relevant state and national conferences

Source: (*63*)

Table 12: Comparison of Alternatives to 2001 Regional Transportation Plan, San Francisco Bay Area

Impact Area	No Project *(Alternative 1)*	System Management *(Alternative 2)*	Blueprint 1 Alternative *(Alternative 3)*	Blueprint 2 Alternative *(Alternative 4)*
Transportation	4	2	2	1
Air Quality	3	3	3	3
Energy	2	3	4	5
Geology/Seismicity	2	3	4	4
Water Resources	3	3	3	4
Biological Resources	2	2	4	5
Noise	2	2	4	4
Visual Resources	1	2	4	4
Cultural Resources	2	2	4	4
Population, Housing and Social Environment	2	2	4	4
Land Use	2	3	4	5
Total	*25*	*27*	*40*	*43*
Average	*2.1*	*2.3*	*3.3*	*3.6*

1=Much More favorable; 2=More Favorable; 3=Comparable; 4=Less Favorable; 5=Much Less Favorable

Source: (78)

Table 14: Environmental Comparison of Wisconsin State Highway Plan Alternatives (*88*)

Impact Category	Plan	Base Case	Alternative 2	Alternative 3
Traffic Congestion	Congestion levels under the plan may be lower than under the Base Case, similar to levels under Alternative 2, and marginally higher than levels under Alternative 3.	Congestion under the Base Case would likely be more severe than other scenarios because it gives priority to preservation of existing pavements with no new major highway projects initiated.	Congestion under Alternative 2 would probably be marginally better than under the Base Case, but slightly worse than under Alternative 3 and the plan.	Congestion under Alternative 3 would probably be lower than other scenarios. It would be somewhat lower that under the Base Case, but very similar to congestion with the plan.
Energy	Energy consumption may be slightly less than under the Base Case, almost equal to Alternative 2, and marginally higher than Alternative 3. However, energy consumption levels for all four scenarios are within 1% of each other.	The Base Case energy consumption is within 1% of estimates of other scenarios. With fewer highway projects completed, there will likely be more congestion and somewhat more overall energy consumption.	Alternative 2 is forecasted to result in about the same amount of energy consumption in year 2020 as would the plan.	Alternative 3 requires the least amount of energy consumption in year 2020. Again, energy consumption levels for all four scenarios are within 1% of each other.
Air Quality	The plan is estimated to have total year 2020 emission levels that would be nearly 14% lower than levels estimated for year 2000.	The Base Case is forecast to provide the smallest overall reduction in emission levels, with projected year 2020 emissions about 12% lower than year 2000 levels.	Alternative 2 is forecasted to provide an overall emission level about 13% lower than year 2000 estimates.	Alternative 3 could result in the most significant overall emission reduction. Year 2020 emissions are projected to be 14% below year 2000 emission levels.
Land Use	Indirect land use impacts are likely to be greater than under the Base Case, including more commercial development in urban and fringe areas and added rural freeway capacity may encourage development in outlying communities.	Under the Base Case, land development should be less dispersed because of fewer expansions major roads. The likelihood of new development along interchanges in the urban fringe is small. Similarly, fewer development impacts are likely to occur in the rural areas.	Alternative 2 may result in greater indirect land use impacts than the Base Case and slightly more than the plan. The greatest difference in indirect land use impacts is likely to occur in urban areas. Less development will occur near or adjacent to interchanges under this alternative.	Development would probably increase the most under Alternative 3 due to additional bypasses, interchanges, and the funding of most emerging Major Projects. Development along rural corridors may be encouraged. Additionally, this alternative would convert the most land from farming to transportation uses.
Economic Development	The plan could provide significantly better traffic movement and access than would the Base Case. Therefore, economic development benefits associated with improved traffic movement and access are likely to be significantly greater under the plan than under the Base Case.	Overall, the Base Case is likely to provide the least economic development benefit when compared with potential benefits of the plan and Alternatives 2 and 3. Additionally, major projects will not be completed until year 2020, delaying associated economic benefits.	Alternative 2 could facilitate economic development already occurring on the Corridors 2020 system. Additionally, the completion of currently enumerated major projects will probably help serve economic development along new or expanded corridors.	Alternative 3 would probably provide the most potential benefit to economic development by placing the highest emphasis on statewide traffic movement through completing currently enumerated major projects, funding emerging major projects, and constructing the greatest number of bypasses and interchanges.
Community Impacts	Because the plan recommends significantly more improvements than the Base Case, the plan would probably have more potential effects. These include impacts to archeological and historical sites, neighborhood business districts, and additional noise in urban and urban fringe areas.	The Base Case may result in fewer negative urban community and archeological impacts than the plan. However, the Base Case may also offer fewer potential positive urban community impacts such as reducing traffic, and improving safety and access to urban core businesses.	Community impacts under Alternative 2 would be generally similar to those under the plan. The construction of some bypasses and interchanges under Alternative 2 may lead to some community separation.	The types of community impacts under Alternative 3 are generally similar to those under the plan. However, the magnitude of potential impacts under Alternative 3 would probably be greater due to the additional improvements that are included.
Sensitive Land & Water	Under the plan, sensitive land and water would be affected by the conversion of 22,000 to 25,000 acres of land to transportation uses by year 2020.	Under the Base Case, between 8,000 and 11,000 acres would be converted to transportation uses by year 2020. This is the lowest total of the four scenarios.	Under Alternative 2, between 20,000 and 23,000 acres of land would be converted to transportation uses by year 2020.	Alternative 3 calls for between 26,000 and 30,000 acres of land to be converted to transportation uses by year 2020. This would be the most land conversion of the four scenarios.
Total Costs (to 2020)	$20.4 billion	$15.2 billion	$19.4 billion	$23.8 billion
Other Benefits	Mobility would probably be better than under the Base Case, similar to traffic movement under Alternative 2, but worse than under Alternative 3.	In general, there is a slightly lower environmental cost with the Base Case as compared to the other scenarios. Also, delay in completing major projects would delay potential environmental effects.	This alternative results in improved traffic movement on the Corridors 2020 highway system.	This alternative results in improved mobility on the entire State Trunk Highway system.

Table 16: Indirect Land Use Impacts Described in Wisconsin State Highway Plan

	Urban Areas	Urban Periphery	Rural Areas
Additional freeway capacity may:	• reduce congestion • make properties adjacent to interchanges and frontage roads more desirable for development or redevelopment • assist existing businesses located at interchanges and along frontage roads through improved access • generate some displacement of existing businesses and homes • increase noise	• encourage development of all types adjacent to or near the facility due to increased access, especially at interchanges and along frontage roads • have greatest potential impacts on development by increasing access to areas most attractive to development • displace existing homes and businesses • impact environmentally sensitive lands	• allow for better movement of people and goods • encourage scattered-site residential development in rural areas, including vacation properties • encourage residential development in smaller communities within the extended commuting radius of larger metropolitan areas • generate auto-oriented commercial development at interchanges • impact environmentally sensitive lands
Additional expressway capacity may:	• have similar impacts to those resulting from freeway expansion • have impacts at both intersections and interchanges due to higher visibility • increase demand for access points	• have similar types of impacts to those resulting from freeway expansion • have impacts at intersections and interchanges	• have similar effects to those resulting from freeway expansion • have impacts at intersections and interchanges
Additional arterial capacity may:	• make adjacent properties more desirable for development and redevelopment • assist adjacent existing businesses through improved access • impact aesthetics of older, established neighborhoods, and business districts • increase demand for off-street parking, if on-street parking is eliminated	• hasten development by making commercial and residential development on available land more desirable • have a more pronounced effect in areas adjacent to larger municipalities • displace some existing businesses and homes • impact environmentally sensitive lands	• according to the definitions used in the SEE analysis, there are no arterials in Rural Areas
Additional interchanges may:	• encourage auto-oriented development and redevelopment • encourage office and/or retail development • displace existing businesses and homes • increase noise and traffic along non-principal roads	• attract all types of development on adjacent land • generate larger-scale effects than improvements in Urban Areas due to larger parcels of semi-vacant land being available • displace some existing businesses and homes • impact environmentally sensitive lands	• generate some auto-oriented development on adjacent land • attract some light industrial and warehousing development • attract some residential development, if within a commuting radius of major city • impact environmentally sensitive lands
Additional bypasses may:	• relieve congestion in downtown business districts • have adverse economic impacts in smaller communities from the loss of through traffic stops • encourage and/or direct development to interchanges along bypasses, especially if urban services are provided there • displace some existing homes and/or businesses • create barriers between neighborhoods if adequate crossings are not provided	• encourage annexation of Urban Fringe Areas by adjacent municipalities, using the bypass as a new growth boundary • direct development of all forms to interchanges, intersections, and adjacent areas • displace existing homes and businesses • impact environmentally sensitive lands	• have minimal impacts, since little opportunity for land use conversion exists without urban services • impact environmentally sensitive lands • fragment and convert farmlands

Source: [*88*]

Table 18: Possible Tools for Identifying Environmental Values

Tool	Use	Strengths	Weaknesses
Economic Measures			
Restoration/ replacement costs	Assigns economic cost to environmental damages	Estimates costs directly related to damaged resource	Some resources irreplaceable; ignores loss of use before replacement;
Travel costs	Assigns economic value to resource based on visitation	Works well when distance to site is key for estimating benefits	Trips often have multiple objectives; confuses payment with value
Ecological Relationships			
Health	Relates ecosystem quality to the performance of key indicators	Provides useful summary measures to gauge impacts of changes over time	Hard to link cause and effect in ecological relationships; choice of indicators may be controversial`
Integrity	Focuses on synergistic and system relationships	Recognizes system-wide characteristics of complex ecosystems	Definitions can vary greatly across experts; human vs nonhuman factors problematic
Resilience	Assesses the long-term viability of a resource	Captures threats to future environmental quality based on past events and ecosystem response	Difficult to measure; translation into comparable policy terms can be controversial
Carrying capacity	Relates fundamental qualities of ecosystem valued to productivity	Tracks key threats to future resource use and availability	Relation of productivity to value may be contested; choice of impact baseline difficult

Table 19: Environmental Factors in Transportation Planning

Planning Step	Consideration of Environmental Factors
Visioning	A community's vision should include explicit consideration of desired environmental characteristics. This could include targeted resources (e.g., air or water quality), geographic areas (e.g., wetlands or habitats), or a more general quality of life consideration. Some MPOs that have used scenarios as a means of better defining desired community visions have included a "protection of environmental resource areas" as one of the scenarios. In such scenarios, economic development and consequent infrastructure provision for these areas are limited.
Goals and Objectives	In most cases, environmental factors are found in some form in a planning goals and objectives set. This most often takes the form of a specific statement as a goal or objective that expresses the intent of "*minimizing the impact on the environment*" or a qualifying phrase that modifies a more important goal "maximize system performance in a way that minimizes environmental impacts."
Performance Measures	This is one of the newest elements of transportation planning that puts in place a set of measures that is continuously monitored to identify the status of the transportation system and of its linkages to other factors. One type of measure or indicator that could be included in this set related to environmental quality. For example, several jurisdictions include air quality measures as part of their system measurement. Other indicators might relate to water quality, wetlands exposure, habitat reduction, historic and cultural resources, and archaeological sites.
Data/Analysis Methods	Given the importance of environmental considerations in the evaluation of plans and alternatives, data should be collected on environmental factors that are of concern to decision makers. Analysis capability using such data is needed to provide some sense of the environmental consequence of each alternative. At the systems planning level, the data and analysis methods might be very general, but would presumably become more specific as the analysis occurs on detailed project or plan alternatives
Alternative Improvement Strategies	The actions adopted as part of the transportation plan could include strategies targeted at enhancing environmental quality. Certainly, the actions that fall out of such programs as the Congestion Mitigation and Air Quality (CMAQ) initiative would relate to improving air quality. Projects could also relate to Transportation Enhancements, strategies to reduce single occupant vehicle use, actions aimed at environmental enhancement (e.g., brownfield developments), and water quality. At the systems planning level, where alternative plan configurations are considered, one scenario could be "environmental preservation", which might focus on such things as minimizing development in river discharge basins.

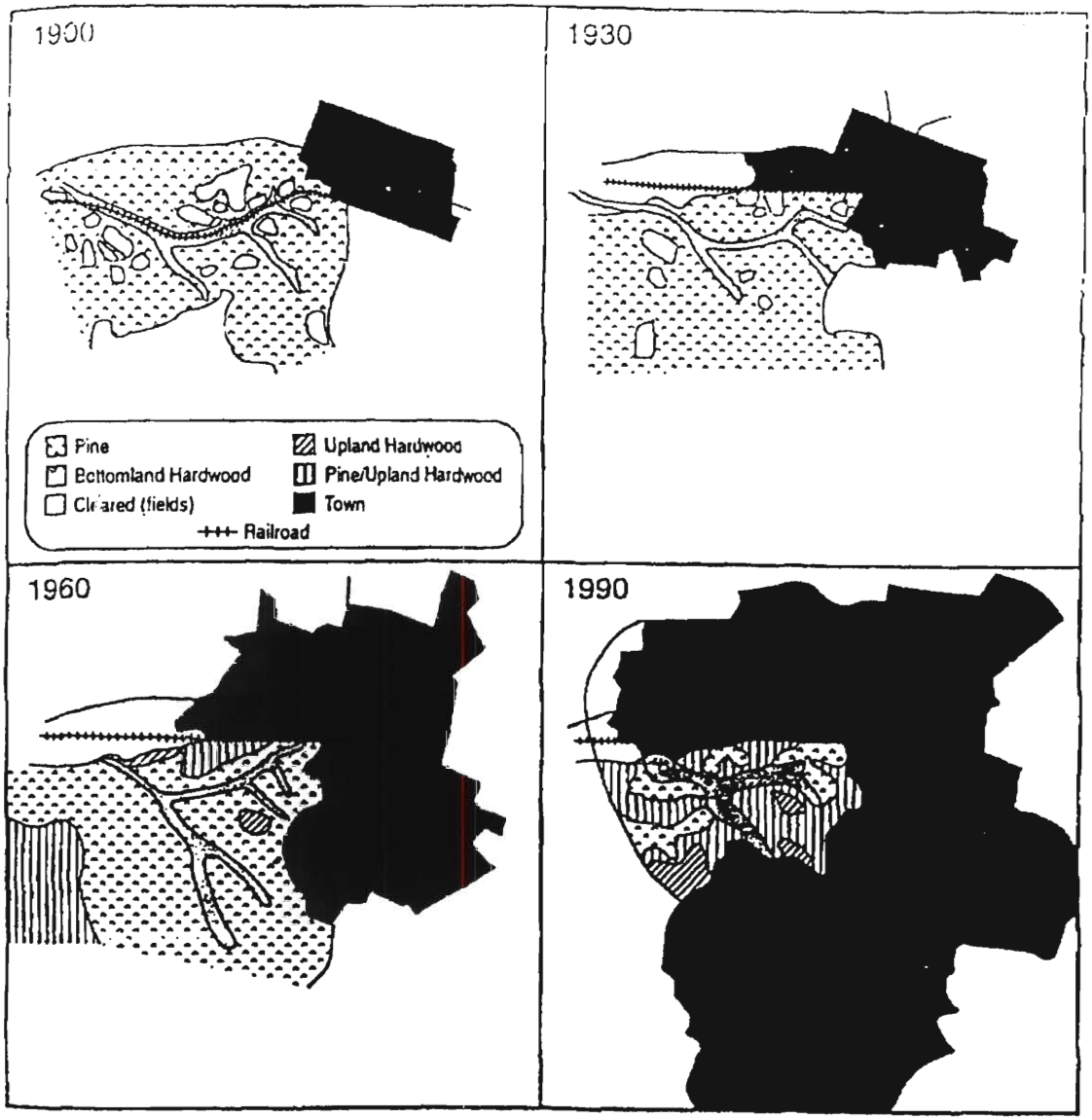
Table 20: Assessment of Atlanta Transportation System Planning Process for Integration of Environmental Factors

Criterion	Assessment	Comments
Existence of mission and vision statement; guidelines	2	The region has fully integrate air quality concerns into system planning and project development, and is doing so for water quality as well. Other environmental factors are not explicitly found in mission or vision statements
Goals and objectives statements	3	Similar to above, air quality is an over-riding issue in the region; general environmental quality is stated as a goal; regional development policies very much oriented to preserving environment
Performance measures	2	Air quality is monitored and reported on an annual basis; there are no other environmentally related performance measures
Data collection	2	Data is collected on air quality, water quality, and development patterns/trends. Little data collected on other environmental factors.
Inventory of sensitive environmental areas	2	This has been done for a major subarea study, however, not for the entire region. Inventories do exist for watersheds and historic sites.
Information for need and purpose	1	The regional planning process has not connected system planning with more detailed project development efforts
Alternatives definition	2	The plan alternatives strongly consider air quality impacts, but do not include other environmental factors in a systematic way
Evaluation criteria	4	The evaluation criteria for plan and project evaluation come from extensive public outreach and comprehensively consider environmental impacts
Environmental consideration in plan	3	The region's plan gives considerable attention to environmental issues
Partnerships	2	The regional agencies work together on plan and project development, but have not entered into formal arrangements concerning expedited review
Public involvement consideration of environmental factors	4	The region's public involvement program covers all aspects of environmental quality, especially air quality. Public concerns with respect to the environment are incorporated into planning activities

1 = Little or no effort 5 = Fully implemented

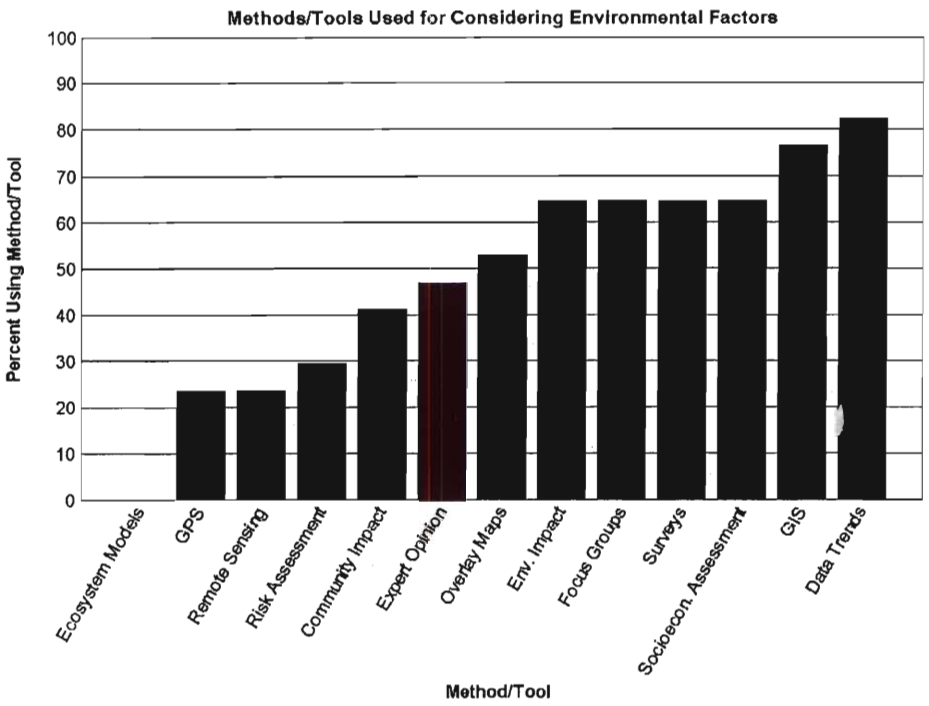
Table 22: Implementation Strategy for CSS in Caltrans

Focus	Strategy	Technique	Responsibility	Schedule
Academies/training/tools	• Provide focused training for staff regarding CSS concepts and applications • Provide specific tools and applications for implementation	• Develop CSS guidelines • Include CSS modules in existing functional academies • Technical case studies/ lessons learned sharing • Develop and distribute tools and applications	• Districts and Divisions will organize CSS training and guides District-wide and Department-wide • Districts will contribute CSS case studies and lessons learned • HQ Divisions will lead tools and application development with Districts	Now
District system management plan (DSMP)	• Use DSMP as Caltrans policy level system planning document to communicate CSS as Department Policy	• Include CSS considerations in DSMPs, particularly under the stated policies and strategies	• Districts will include CSS concepts in DSMP • DOTP will incorporate CSS support and info in the DSMP guidelines	Now
Transportation corridor report (TCR)	• Long-range Caltrans concepts for state highways must address CSS	• Include CSS considerations in TCRs • TCR should include a route/ corridor context for use in project documents	• District planning will include CSS strategies in TCRs • DOTP will revise System Planning guidelines to include CSS	Now
Transportation system development program (TSDP)	• TSDP, as project information element in Systems Planning process, must address CSS	• Include CSS element in TSDPs	• Districts will include CSS elements in each TSDP • DOTP will include CSS in guidelines	Now
Transportation planning grants	• Use DOTP discretionary planning grants as stimulus for CSS considerations by planning and local agencies	• Incorporate CSS support in the grant guidelines • Include information in grant criteria to encourage CSS	• DOTP will include CSS support in grant guidelines • Districts will facilitate consideration of CSS strategies in all grant applications	Now
Project initiation documents (PIDs)	• CSS as part of project initiation becomes an integral part of all projects	• Include CSS strategies in PID guidelines • Include CSS consideration in all PIDs • Include "Statement of Context" in all project reviews	• Districts will include CSS strategies in PIDs • Districts will facilitate the involvement of CSS stakeholders in the development of PIDs • HQ Design will enhance CSS concepts in PDPM	Now

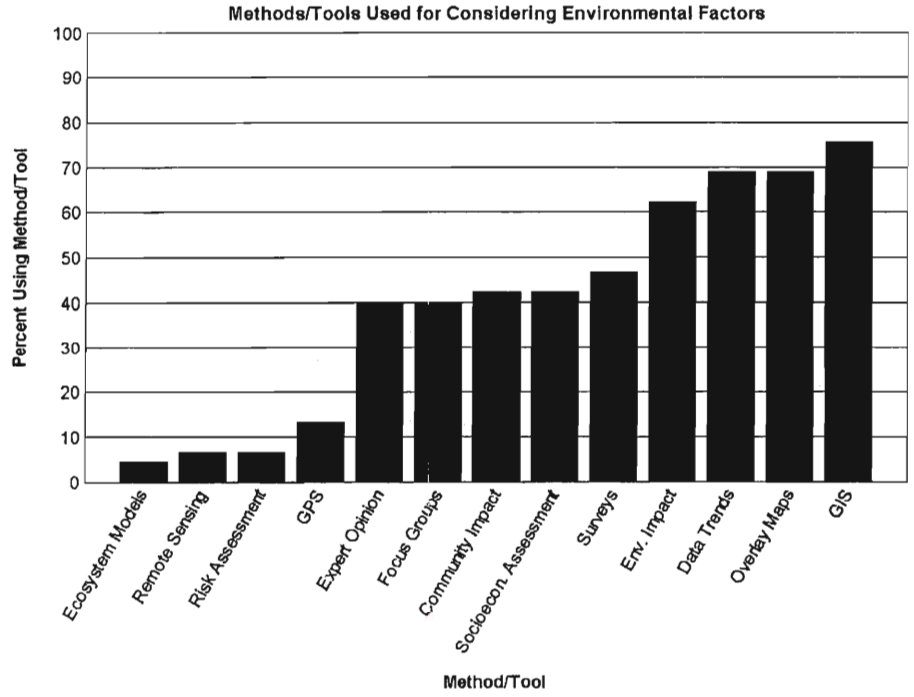


Source: (12)

Figure 1: Impact of Urbanization on an Urban Ecology, Aiken, SC

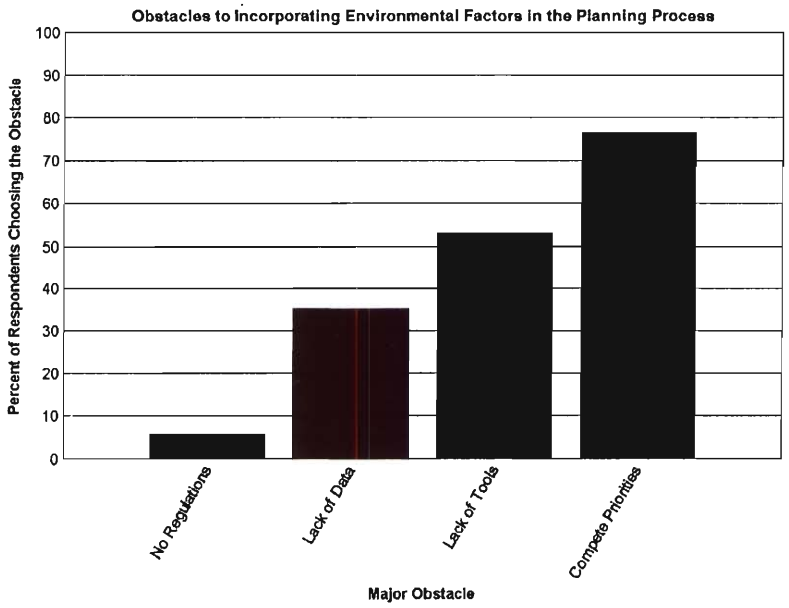


State DOTs

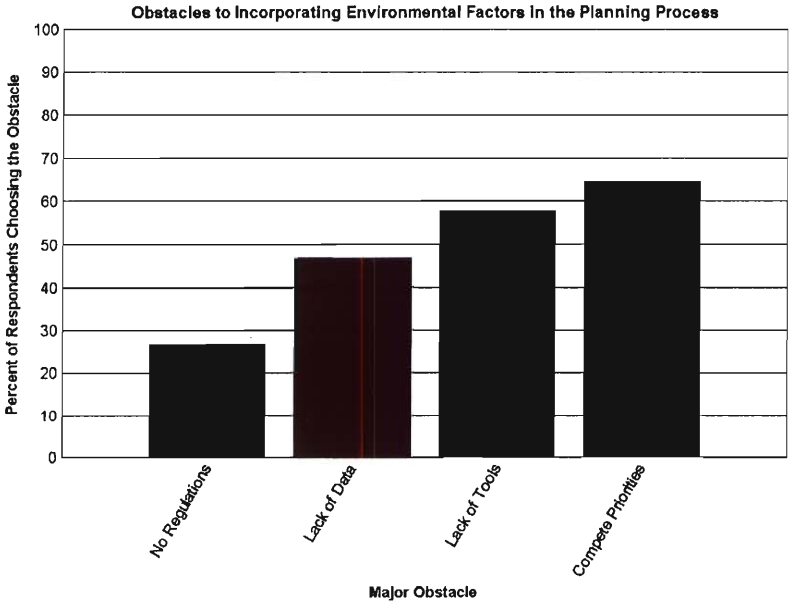


MPOs

Figure 3: Most Important Methods and Tools for Environmental Consideration, State DOTs and MPOs

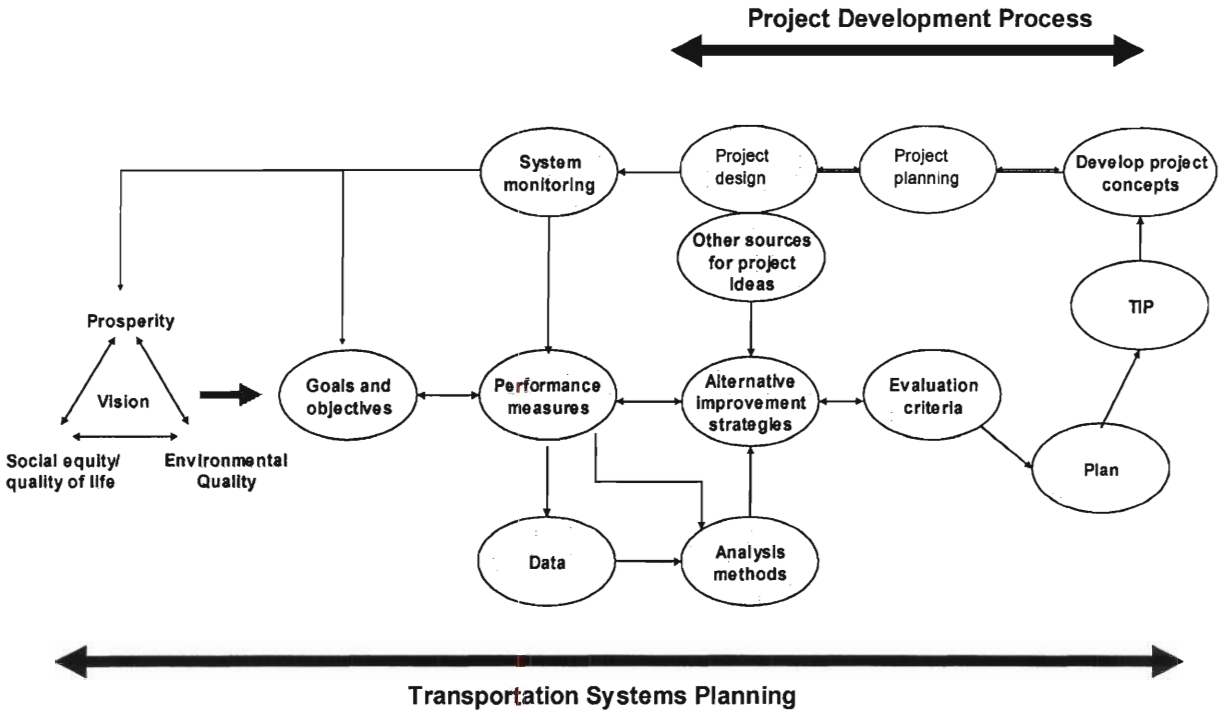


State DOTs



MPOs

Figure 5: Obstacles to Incorporating Environmental Factors into Transportation Planning, State DOTs and MPOs



Source: (*36*)

Figure 7: Conceptual Framework of Transportation System Planning and Project Development

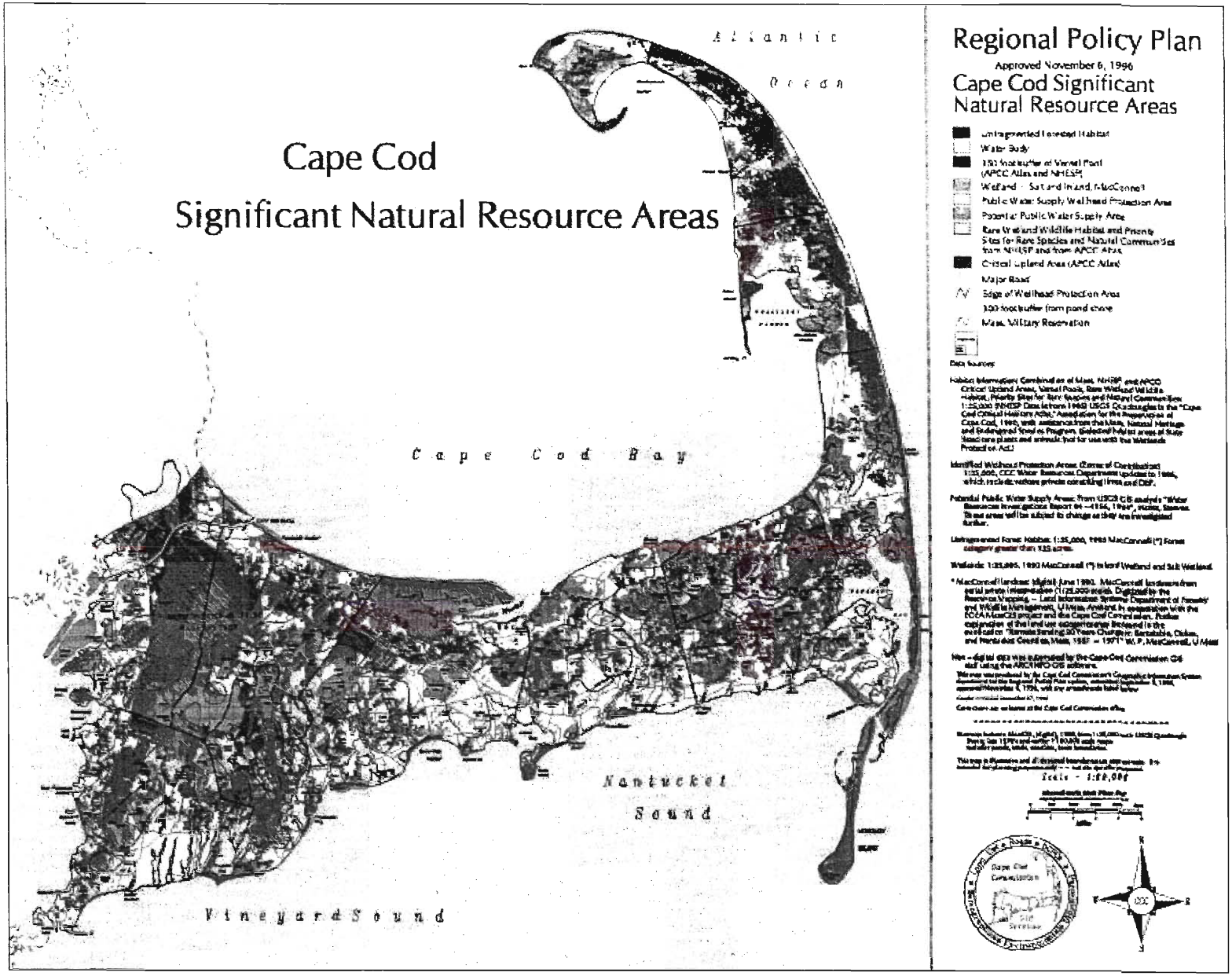


Figure 9: Environmentally Sensitive Areas Mapped Using GIS, Cape Cod

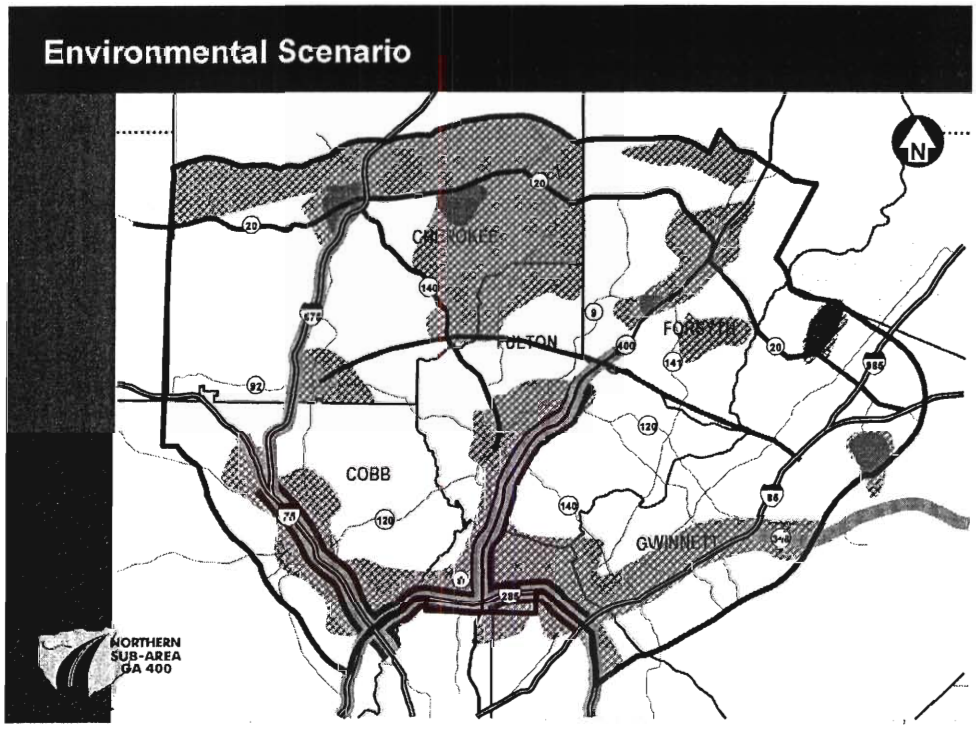


Figure 11: Environmental Scenario in Atlanta

PERFORMANCE CRITERIA MATRIX *Prunedale Freeway Project*	Caltrans

											TOTAL	%
Accident Reduction	A	a	a	a	a	a	a	a	a	a	9.0	20%
Local Circulation	B	b/c	b	b	b	g	h	b	b		5.5	12%
Congestion Level	C	c	c	c	c	g	h	c	c		5.5	12%
Local vs. Through Traffic	D	d	d	g	h	d	d				4.0	9%
Support of Business Infrastructure	E	e	g	h	e	e					3.0	7%
Support of Mass Transi	F	g	h	f	f						2.0	4%
Environmental Impacts	G	g	g	g							8.0	18%
Emergency Response Tin	H	h	h								7.0	16%
Constructibility	I	I									1.0	2%
Schedule	J										0.0	0%
											45.0	100%

a	More Important
a/b	Equal Importance

Source: (77)

Figure 13: Evaluation Criteria for Freeway Project Planning in California

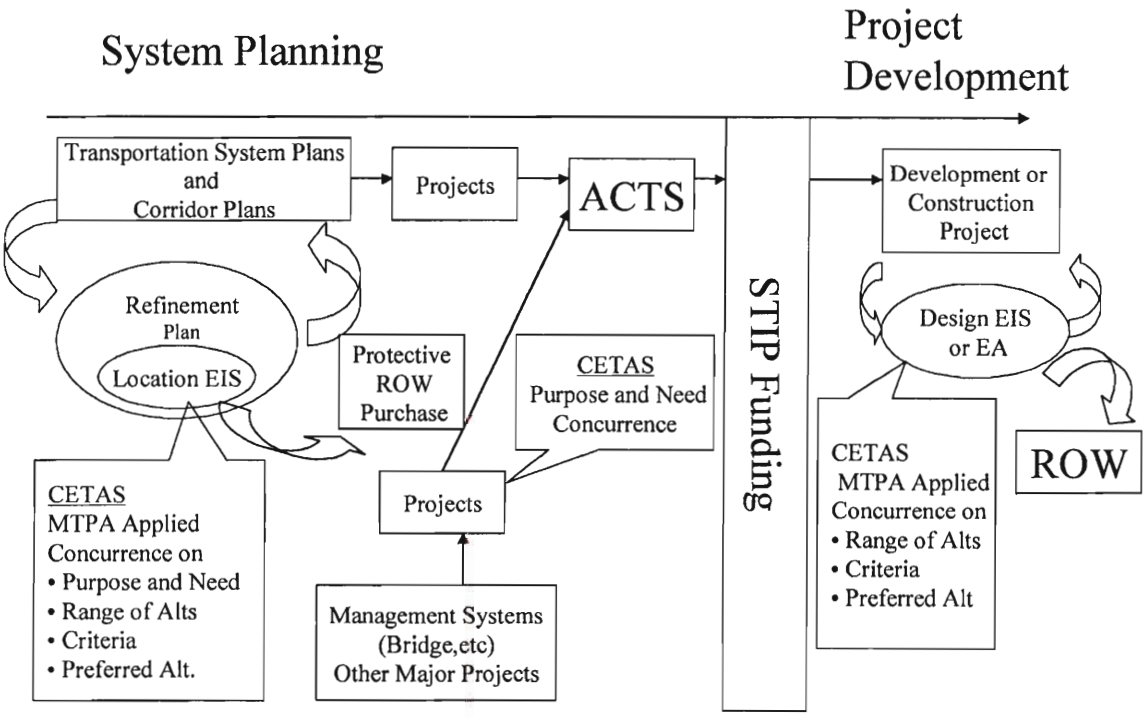
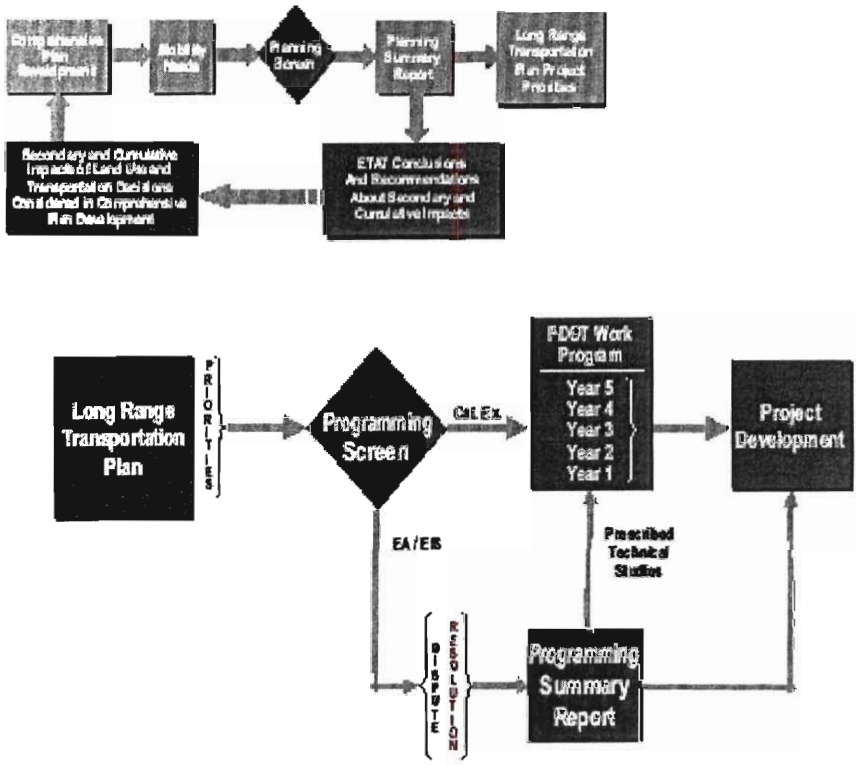
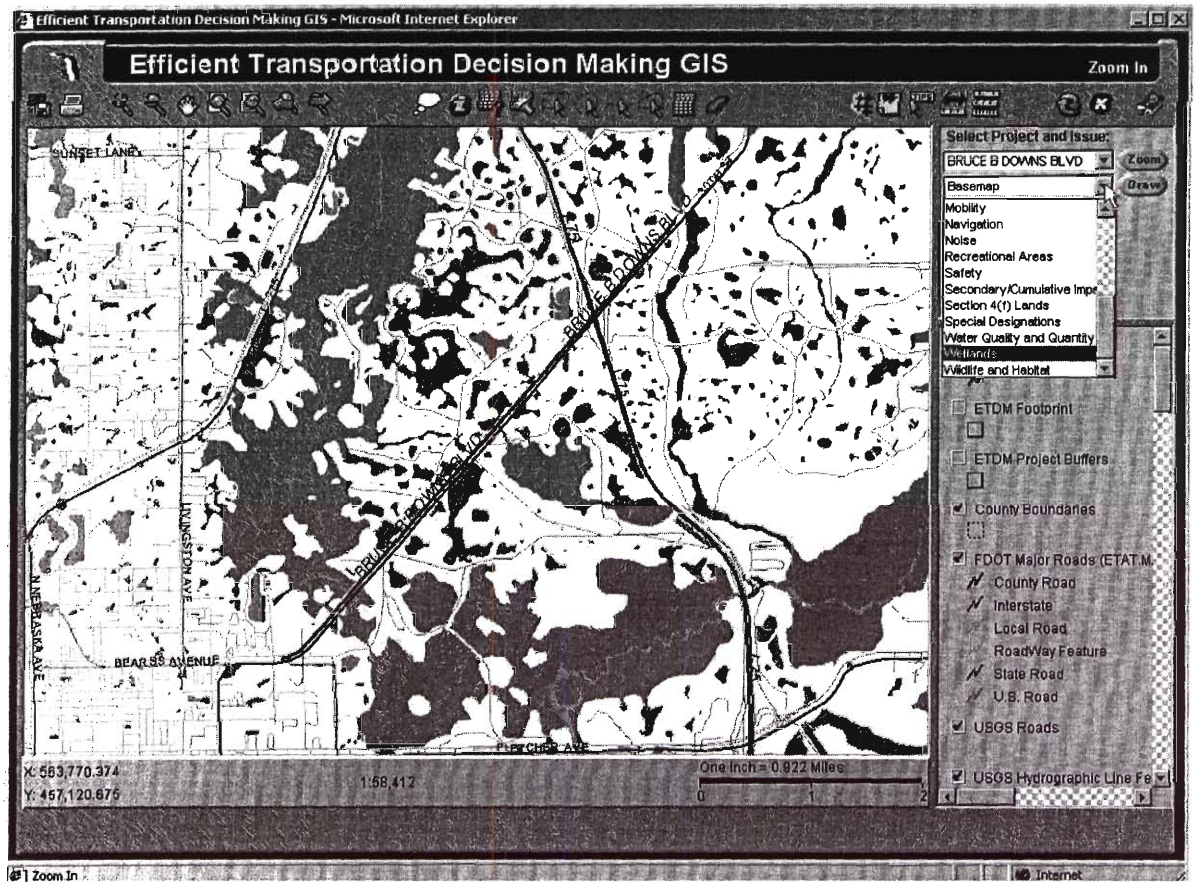


Figure 15: Oregon's NEPA Process with Streamlining



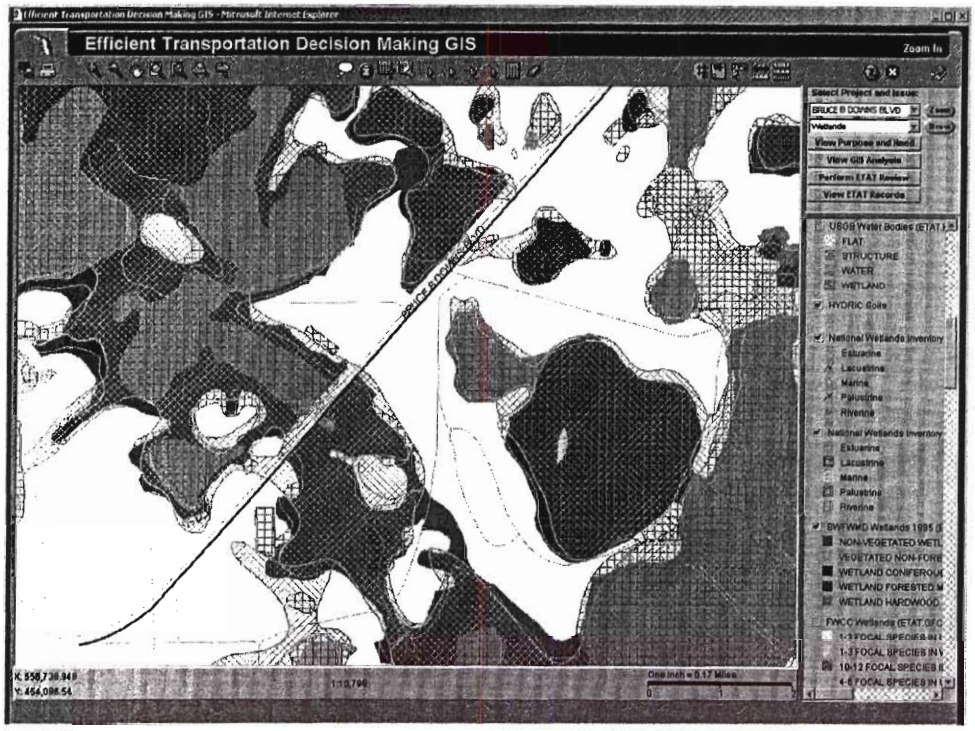
Source: (77)

Figure 17: FDOT Screening Tool in Planning and Programming

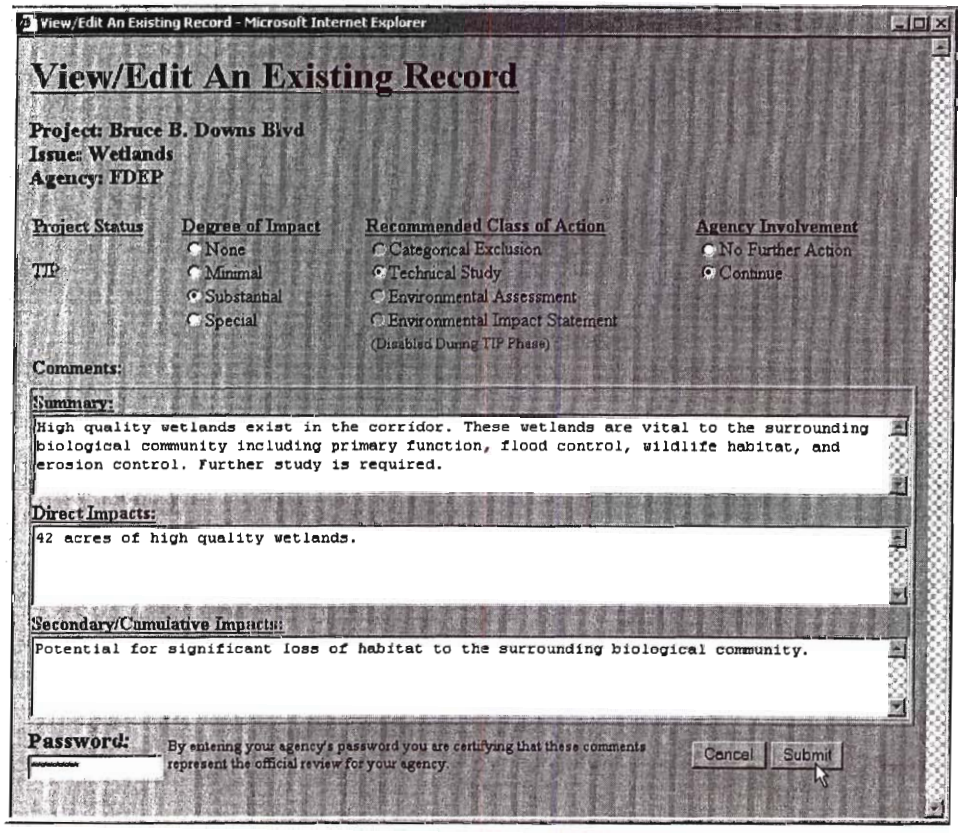


a) Identifying the Wetlands Inventory

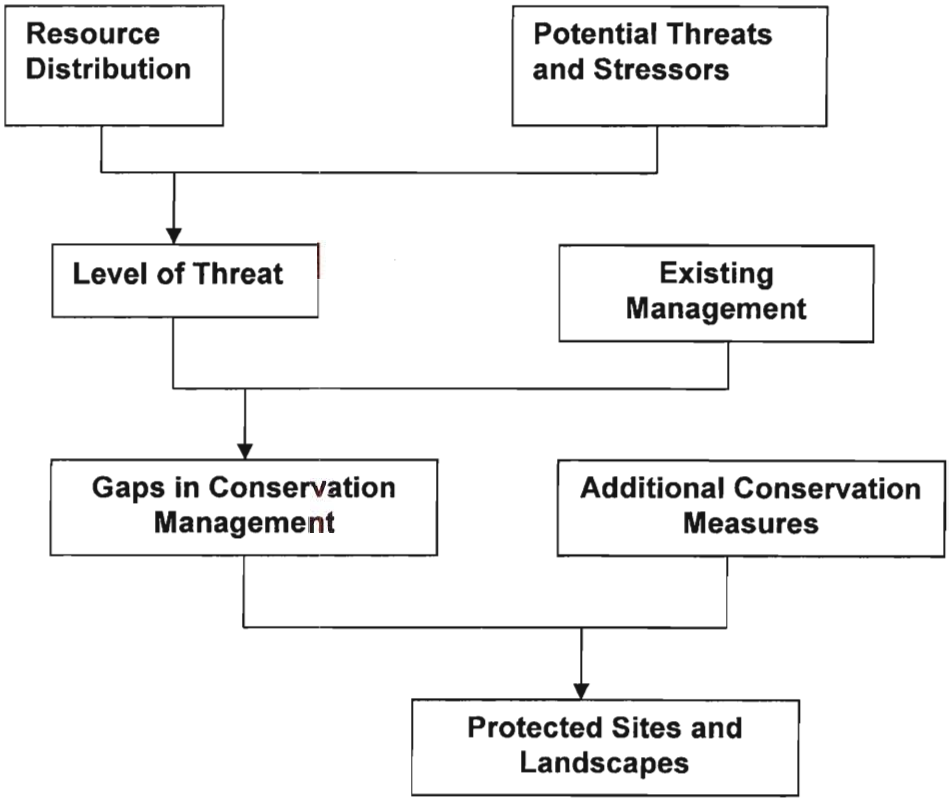
Figure 19: Using the Florida DOT Environmental Screening Tool



e) Wetlands by Type in Selected Area



f) Project Record



Source: (*85*)

Figure 20: Resource Analysis Methodology for the Sonoran Desert Conservation Plan

a. Does the plan contain any "major and significant new proposals" (proposals are significant if the combined impact of all the plan's elements is potentially significant with respect to the human environment, and if the combined effect of all the elements in the plan or any single element would represent a significant departure from (or expansion of) the WisDOT's existing responsibilities as identified in TRANS 400.04(19).)

☐ Yes [SEE required; list at least one of these proposals below]: _____

_____

☐ No [attach list of **all** proposals contained in the plan, and the reason for finding as non-major: (a) not developed by DOT, (b) no significant environmental impact, or (c) not a significant departure from or expansion of DOT responsibility]

☐ Unknown at this time [additional study required to support finding on SEE]: _____

_____

☐ No [list **all** actions on a separate page, along with the reason they are found to be non-major: (a) category III action, or (b) category IV action.]

☐ Unknown at this time [additional study required to support finding on SEE]

b. Does the plan, in its entirety, represent a "major and significant new proposal"?

☐ Yes [SEE required]

☐ No ☐ Plan not developed by DOT

☐ No significant potential for environmental impact

☐ No significant departure from or expansion of DOT responsibility.

☐ Unknown at this time

C. DETERMINATION

[Fill in blanks and delete phrases or sentences which do not apply.]

Based upon the findings stated above and the requirements stated in the Wisconsin Department of Transportation's regulations on environmental documentation (Trans 400), I have determined that a system-plan environmental evaluation (SEE) [is/is not/may be] required to be prepared as part of this plan [and additional analysis will be done during the preparation of this system plan to make a final determination].

Approved by:

_____ _____

Director, Bureau of System Planning Date

Reviewed by:

_____ _____

Director, Office of Environmental Analysis Date

_____ _____

Chief, Environmental Strategies Section Date

Prepared by:

_____ _____

Signature Date

Source: (*87*)

Figure 21 Cont'd: Wisconsin's Systems-plan Environmental Evaluation Screening Tool

APPENDIX A: STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) AND OECD GUIDELINES

SEA DIRECTIVE

The SEA Directive adopted by the European Parliament and Council in 2001 is one of the most important legislative initiatives regarding Strategic Environmental Assessments (SEAs) in the world. The purpose of the SEA Directive is to ensure that environmental effects of certain plans and programs are identified and assessed during the planning process. The requirements set forth in the Directive are to be integrated into existing procedures in Member States for the adoption of plans and programs or incorporated into new procedures. The Directive requires the preparation of an environmental report that identifies, describes, and evaluates the likely significant effects on the environment of implementing the plan/program as well as the identification of reasonable alternatives.

Environmental Report Requirements

The information to be contained in the environmental report includes (*1*):

- An outline of the contents, main objectives of the plan or program and its relationship with other relevant plans and programs
- Relevant aspects of the current state of the environment and likely evolution thereof without implementation of the plan or program
- The environmental characteristics of areas likely to be significantly affected
- Any existing environmental problems that are relevant to the plan or program including those related to any areas of particular environmental importance
- The environmental protection objectives, established at the international, European Community or Member state level, which are relevant to the plan or program and the way in which those objectives or any environmental considerations have been taken into account
- The likely significant effects on the environment, including such issues as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between aforementioned factors
- The measures envisaged to prevent, reduce and offset any significant adverse effects on the environment of implementing the plan or program
- An outline of reasons for selecting the alternatives dealt with and a description of how the assessment was undertaken including any difficulties encountered in compiling the required information
- A description of the measures envisaged concerning monitoring of the implementation of the plan or program
- A non-technical summary of the information provided under the above headings

- Enabling **effective feedback** to be made
- Providing sufficient time and resources to carry out **public participation**
- Ensuring that the results of the evaluation are taken into consideration in the **final decision**

SEA AND INTEGRATION OF THE ENVIRONMENT INTO STRATEGIC DECISION-MAKING

The European Commission issued a report that examines the benefits, challenges and methods for integrating environmental factors into decisions concerning plans, policies and programs (*3*). The following sections describe key success factors gained from this study and recommendations for the effective implementation of SEA as well as for integrating the environment into decision-making.

Key Factors in SEA

Key factors identified for successful SEA include the following:

- **Legislative Support**: The most successful SEA generally occurs where there is a legal obligation that requires it to be undertaken.
- **Transparency**: SEA needs to be a transparent process that allows environmental considerations to be highlighted.
- **Early Consideration**: Successful SEAs have occurred at the beginning of a planning process rather than at the end of a project development effort, and may serve as a catalyst for developing further guidance and training
- **Alternative Options versus Option Alternatives**: Successful SEA assesses the impacts of alternative options rather than option alternatives
- **Public Participation**: Widespread involvement of stakeholders, policymakers and the wider public is crucial for a successful SEA
- **Open Communication**: A successful SEA is an active, participatory and education process for all parties, in that stakeholders are able to influence the decision maker, and the decision maker is able to raise awareness of the strategic dimensions of the policy, plan or program
- **Information Accessibility**: A successful SEA involves wide use and dissemination of baseline and assessment information
- **High Quality Assessment**: A successful SEA depends on high quality and rigorous application of assessment methodologies, whether qualitative, quantitative or both.
- **Systematic Process**: An SEA needs to be a systematic process involving different institutions in a common reporting framework
- **Independent Review**: An independent body that can review or audit the assessment process and content is needed to provide sufficient incentive to carry out an SEA in an accountable way.

Guidance and training

1. Guidance and training is essential for successful SEA efforts agency or country wide
2. Mechanisms need to be developed within government departments and organizations to foster and retain 'institutional memory.'
3. Guidance should be developed by the European Commission for carrying out SEA at the most strategic policy levels.

LESSONS LEARNED IN SEAs OF TRANSPORT CORRIDORS

A recent publication, *SEA of Transport Corridors: Lessons Learned in Comparing the Methods of Five Member States* (*4*), analyzes five SEAs of multimodal transportation corridors and concludes with several valuable lessons.

Consultation and Participation

- Information sharing, consultation and participation are essential and will have the greatest positive impact when initiated at the earliest stages.
- Consultation and participation should include all stakeholders and the public to ensure wide "buy in" to the solutions being proposed
- The public and stakeholders need to be informed about the SEA process and the options being considered from the beginning of the process
- Information needs to be presented clearly and simply in terms that are relevant to the stakeholders

Scoping

The scoping stage is viewed as the most critical stage in an SEA. It provides an opportunity to inform the stakeholders and obtain their views on objectives, indicators, initial alternatives and data availability. Scoping requires a decision on which themes, objectives and indicators are necessary and sufficient for the scale and level of the decision being made.

Outlining Alternatives

Alternatives identification is viewed as the step where SEA can make the greatest and most constructive contribution to sustainability and environmental protection. This stage was also found to be the most dynamic and intensive phase of the SEA process. Several important lessons learned in this stage include:

- Identify alternatives while keeping in mind the overall objectives, which may include a mixture of environmental, socio-economic, and transportation-based objectives;
- Consider both infrastructure and policy-type alternatives

expertise and inadequate institutional collaboration. The Trans-Pennine Corridor (TPC) study in the United Kingdom was one of the five pilot studies funded by the European Commission. Figure A-1 shows the main steps that were undertaken in this study.

Figure A-1 about here

ENVIRONMENTALLY SUSTAINABLE TRANSPORT GUIDELINES

The OECD Environmentally Sustainable Transport (EST) Guidelines were developed to provide a strategy for sustainable development and future-oriented policy making and practice in the transport sector. The guidelines are based on an understanding of unsustainable transport trends, a definition of EST, and health and environmental criteria that are associated with sustainable development. In addition, the report identifies ten guidelines for achieving EST and provides explanations as to the application of the guidelines. The OECD EST Guidelines are presented in Table A.1.

Table A.1 about here

INDICATORS FOR THE INTEGRATION OF ENVIRONMENTAL CONCERNS INTO TRANSPORT POLICIES

In 1991, OECD recommended that transportation/environmental indicators be developed to better facilitate decision-making at the national, international and global levels, and to integrate environmental concerns into transportation decision-making. The conceptual approach in developing sector indicators is outlined in (*6*). Indicators are proposed for three major themes: sector trends of environmental significance; environmental impacts of the transportation sector (with respect to pollution and natural resource use); and economic linkages between transportation and the environment. Indicators that have internationally comparable, comprehensive, and readily available data are presented in tabular and graphical form along with notes on their relevance to transportation and environmental policies, the conceptual base, and data sources. The indicators proposed for the integration of environmental concerns into transportation policies are presented in Table A.2.

Table A.2 about here

CANADA – SEA AND SUSTAINABLE TRANSPORT RESOURCES

A 1999 Canadian Cabinet Directive on Environmental Assessment of Policy, Plan and Program (*7*) proposals requires an SEA when a proposal is submitted to an individual Minister or Cabinet agency for approval, and when implementation of the proposal may result in important environmental effects, either positive or negative. The *Guidelines for Implementing the Cabinet Directive* (*8*) were prepared to provide more detail on the process of conducting an SEA and in preparing the SEA report. The Cabinet Directive and the Guidelines can be accessed online for more information at:

http://www.ceaa-acee.gc.ca/0011/0002/dir_e.htm

How to Conduct Environmental Assessments of Policy, Plan and Program Proposals (*9*) is another guidance document to help in the preparation of SEAs in Canada. This guidance document discusses what must be done, why environmental assessments are required, who should be involved, when the assessment should be performed, how it

6. Organization for Economic Co-Operation and Development (OECD). *EST-Environmentally Sustainable Transport Guidelines.* Presented and endorsed at the international conference in Vienna, Austria, October 4th to 6th, 2000. Accessed at http://www.oecd.org/pdf/M00006000/M00006604.pdf in July 2002.

7. Canadian Environmental Assessment Agency. *The 1999 Cabinet Directive on the Environmental Assessment of Policy, Plan, and Program Proposals.* Accessed at http://www.ceaa-acee.gc.ca/0011/0002/dir_e.htm in July 2002.

8. Canadian Environmental Assessment Agency, *Strategic Environmental Assessment: The 1999 Cabinet Directive on the Environmental Assessment of Policy, Plan, and Program Proposals, Guidelines on Implementing the Cabinet Directive,* 2000, Accessed at http://www.ceaa-acee.gc.ca/0011/0002/dir_e.htm in July 2002.

9. Canadian Environmental Assessment Agency, *Strategic Environmental Assessment at Environment Canada: How to Conduct Environmental Assessments of Policy, Plan, and Program Proposals*, Prepared by the Environmental Assessment Branch, Environmental Protection Service, and National Programs Directorate. Feb. 4, 2000.

10. Marbek Resource Consultants. Performance Indicators for Environmentally Sustainable Transportation – A Discussion Paper. Submitted to Transport Canada. September 12, 1996. Accessed at http://www.tc.gc.ca/../envaffairs/english/sustainability/eperform.pdf in July 2002.

Arizona	Executive Order 99-2 as Amended by Executive Order 2000-16: Governor's Transportation Vision 21 Task Force	Governor Jane Dee Hull issued this Executive Order which established the Governor's Transportation Vision 21 Task Force to serve the purpose of "evaluating current practices, resources and infrastructures, and recommending and prioritizing the goals, funding, and specific plans that will establish a vision for transportation in Arizona for the 21st century."
		The Task Force recommended the adoption of performance based planning and programming and coordinating land use planning and transportation planning. However, to date, no mechanisms have been identified to coordinate land use and transportation.
	Guidance on Title VI and Environmental Justice	This discussion paper was prepared to provide an overview of Title VI and Executive Order 12898 on Environmental Justice as they relate to the environmental planning process. It provides information on procedures to ensure that Title VI and EO 12898 factors are adequately considered in the planning process through utilization of public involvement and a systematic interdisciplinary approach to the identification and evaluation of alternatives, as well as by continuing to identify, avoid, minimize and mitigate adverse impacts.
	Growing Smarter Act of 1998 and Growing Smarter Plus Act of 2000	Growing Smarter and Growing Smarter Plus are closely intertwined, as the Plus legislation included amendments to the original Act. Governor Jane Hull signed into law both of these acts, which require cities and counties to address issues associated with urban growth and development. The general plan required by these acts must include the elements of land use and circulation and may include (depending on the city size) the elements of open space; growth area; environmental planning; cost of development; water resources; conservation; recreation; public buildings; public services and facilities; housing; conservation, rehabilitation, and redevelopment; safety; and bicycling. ADOT helps fund the development of and reviews the transportation component of the cities' and counties' General Plans.
Arkansas	Arkansas Code 21-1-102	The transportation policy of the state of Arkansas includes enhancing "the social and economic well-being of the citizenry of the state."
California	Senate Bill 45, Chapter 622, Statutes 1997	This bill requires the Department of Transportation to develop guidelines including objective criteria for measuring system performance and cost-effectiveness of candidate projects for placement in the TIP.
	1998 California Transportation Plan Transportation System Performance Measures Report	The Transportation System Performance Measures Report identifies performance measures to aid in the decision making process, including environmental quality, equity, and economic well-being.

Connecticut	Connecticut General Statutes 13b-15 (Master Transportation Plan)	States that "the commissioner shall develop and revise biennially a comprehensive, long-range, master transportation plan designed to fulfill the present and future needs of the state and to assure the development and maintenance of an adequate, safe and efficient transportation system." This plan is intended to provide the Administration, General Assembly, local elected officials, and members of the general public with an understanding of the projects and programs that the Department will be pursuing over the next 10 years. In this plan, the commissioner of ConnDOT should "consider, among other things, federal air quality standards, conservation and cost of energy supplies...as well as long-range land use, environmental and energy impact and economic development patterns."
	Connecticut Environmental Policy Act (Connecticut General Statutes Sec. 22a-2a)	Considered during project design and implementation.
	Inland Wetlands and Watercourses (Connecticut General Statutes Sec. 22a-36)	Considered during project design and implementation.
	Tidal Wetlands (Connecticut General Statutes Sec. 22a-28)	Considered during project design and implementation.
	Structures and Dredging (Connecticut General Statutes Sec. 22a-361)	Considered during project design and implementation.
	Flood Management by State Agencies (Connecticut General Statutes Sec. 25-68b)	Considered during project design and implementation.
Delaware	17 Delaware Code Section 8404	It is the duty of the Secretary of Transportation "to prepare a statewide master transportation plan that is consistent with the state's social, economic and environmental needs and goals."
	Livable Delaware Initiative, Executive Order No. 14	This Initiative was passed on March 28, 2001 by Governor Ruth Ann Minner. It introduced the Livable Delaware initiative, stated eleven goals, and required each department to complete an implementation plan to address these goals. Transportation-related land use goals as identified by DelDOT are: 1. Direct investment and future development to existing communities, urban concentrations, and growth areas. 2. Protect important farmlands and critical natural resource areas. 3. Streamline regulatory processes and provide flexible incentives and disincentives to encourage development in desired areas. 4. Encourage redevelopment and improve the livability of existing communities and urban areas, and guide new employment into underutilized commercial and industrial sites. 5. Promote mobility for people and goods through a balanced system of transportation options. 6. Coordinate public policy planning and decisions among state, counties and municipalities.

Georgia	Title 32 (32-2-3) Georgia Code	Title 32 of the Georgia Code requires the Department of Transportation to develop a comprehensive, statewide 20-year transportation plan that takes into account "the total environment of the community and region including land use, state and regional development goals and decisions, population, travel patterns, traffic control features, ecology, pollution effects, esthetics, safety, and social and community values."
	Georgia Environmental Policy Act (GEPA) - Georgia Code 12-16	GEPA requires that an environmental affects report be prepared for all governmental actions which may significantly adversely affect the quality of the environment. This report is to include the environmental impact of the proposed action, alternatives, and mitigation measures. The long-range transportation plan is not subject to this act, it is only applicable to project level planning.
Hawaii	HRS 279a-2, Statewide Transportation Plan	Requires HDOT to prepare a statewide transportation plan that is "directed toward the ultimate development of a balanced, multi-modal statewide transportation system that serves clearly identified social, economic and environmental objectives." The statewide transportation plan is to include projected transportation needs for a six-year period and a schedule of priorities for the construction, modification and maintenance of various segments of the statewide plan that may require state financial assistance for a twenty-year period. Both the six-year and twenty-year estimates are to be updated annually.
	Hawaii State Planning Act, HRS 226;	The Hawaii State Planning Act sets for objectives and policies for transportation planning. One of these objectives is planning a "statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the state." Some policies include: --Encouraging the development of transportation systems and programs which would assist statewide economic growth and diversification --Encouraging the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment --Encouraging the safe and convenient use of low-cost, energy efficient, non-polluting means of transportation --Coordinating intergovernmental land use and transportation planning activities --Encouraging diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency The Hawaii State Planning Act also sets goals and objectives for the economy, physical environment, other facilities systems, and socio-cultural advancement.

Maine	MDOT's Environmental Policy Statement	This statement, adopted November 1998, states that a policy of the Maine Department of Transportation is to "continuously evaluate actions for their impacts upon environmental resources" and to "conduct activities so as to avoid and minimize those impacts". One of the stated methods of accomplishing the policy is to "develop and utilize an Integrated Transportation Decision-making process (ITD) regarding transportation projects that incorporate environmental considerations from the earliest planning state through construction and maintenance."
	Maine's Sensible Transportation Policy Act (23 M.R.S.A. E16773)	Maine's Sensible Transportation Policy Act requires that transportation planning decisions "minimize the harmful effects of transportation on public health and on air and water quality, land use and other natural resources." This act also requires an alternatives analysis (23 M.R.S.A. §73(3)(B)).
	Maine's Site Location of Development Law (38 MRSA 481)	The purpose of this subchapter is to provide a practical means by which the state can "control the location of those developments substantially affecting local environment in order to insure that such developments will be located in a manner which will have a minimal adverse impact on the natural environment within the development sites and of their surroundings and protect the health, safety and general welfare of the people." Standards for development are provided in accordance with the aforementioned environmental goal.
	Maine Dept. of Environmental Protection's Chapter 305, Natural Resources Protection Act (38 MRSA 480-A) - Permit by Rule Standards	The findings of this subchapter include that the "State's rivers and streams, great ponds, fragile mountain areas, freshwater wetlands, significant wildlife habitat, coastal wetlands and coastal sand dunes systems are resources of state significance." Standards and permit processes are provided regarding activities that affect soils and waters.
Maryland	Maryland Transportation Performance Act (May 2000)	The Maryland Transportation Performance Act requires MDOT to apply performance measures to the Maryland Transportation Plan and the State's Consolidated Transportation Program (CTP) or capital improvement program. In response, MDOT, assisted by an appointed advisory committee, developed a set of measurable, meaningful and manageable indicators to assist the Department. Beginning in 2002, an Annual Attainment Report of Transportation System Performance will accompany the Maryland Transportation Plan and the CTP. Legislation requirements can be found in §2-103.1 of the Transportation Article of the Maryland Code.
	Maryland Smart Growth and Neighborhood Conservation Act and Executive Order	Issued in 1997 by Governor Glendening, this initiative directs growth to areas where it is most environmentally suitable while protecting some of the State's most ecologically and environmentally valuable landscapes. It calls for transportation investments that satisfy current and projected travel demands while supporting smarter growth patterns.

Massachusetts	Massachusetts Environmental Policy Act (MEPA)	MEPA requires state agencies to study the environmental consequences of their actions and to take all feasible actions to avoid, minimize, and mitigate damage to the environment. MEPA further requires state agencies to "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted. This regulation ties together transportation, land use, and environmental planning (301 CMR 11.03).
	Executive Order No. 385 - Planning for Growth	This executive order was issued by Governor William Weld in April of 1996. It recognizes that "conflict between environmental quality and economic activity ultimately puts at risk environmental resources as well as economic opportunity" and states that "such conflict can be avoided to a great extent through proactive and coordinated planning oriented towards both resource protection and sustainable economic activity, known as growth management." All agencies are directed to "evaluate the effect of their current regulations, policies, plans and practices on their and others' ability to facilitate sustainable economic development and to preserve environmental quality and resources, and adopt changes to the extent necessary to effectively contribute to the attainment of these objectives."
Minnesota	Minnesota State Statutes, Chapter 174.01, Subdivision 2	One of Minnesota's 14 transportation goals is "to ensure that the planning and implementation of all modes of transportation are consistent with the environment and energy goals of the state."
	Minnesota State Statutes, Chapter 174.03, Subdivision 1 (2)	Chapter 174.03, Subdivision 1 (2) of the Minnesota State Statutes states that the commissioner shall evaluate alternative transportation programs proposed for inclusion in the statewide transportation plan in terms of "impact of present and planned land uses, environmental effects, and energy efficiency".
	Sustainable Development Act	This act, passed in 1996, defines sustainable development as any "development that maintains or enhances economic opportunity and community well-being while protecting and restoring the natural environment upon which people and economics depend." It directed the Minnesota Environmental Quality Board (EQB) to adopt principles of sustainable development and requires MnDOT to report to the EQB on how the missions and programs of the DOT reflect and implement the state sustainable development principles, or how they could be changed to do so.
	Minnesota Environmental Policy Act (Minnesota State Statutes Chapter 116D)	The Minnesota Environmental Policy Act requires all state agencies to "utilize a systematic, interdisciplinary approach that will insure the integrated use of the natural and social sciences and the environmental arts in planning and in decision making which may have an impact on the environment."

New Jersey	New Jersey State Planning Act of 1986, N.J.S.A. 52:18A-196 et seq	The New Jersey State Planning Act requires sound and integrated statewide planning for the state to "...conserve natural resources, revitalize urban centers, protect the quality of its environment, and provide needed housing and adequate public services at a reasonable cost while promoting beneficial economic growth...."
New Mexico	NM Admin. Code, Title 18, Trans. and Highways, Chapt.1, Trans. General Provisions, Part 4,	This rule establishes procedures for Transportation Development Districts (TDDs) for project funding and for the State Transportation Authority (STA) to evaluate and prioritize such funding requests for planning statewide, regional and local transportation systems. The rule is limited in application to only planning/study proposals. A project ranking system is set forth that includes environmental impacts and alternatives analysis as part of the criteria for ranking.
	NM Admin Code, Title 2, Public Finance, Chapter 40, Part 30, Infra Bank	This rule specifies the procedures and conditions for eligible public entity may apply for and obtain financial assistance from the bar k. Per NMAC 2.40.30.13 D, prior to granting preliminary approval of an eligible project for financial assistance, the commission will consider "potential social, economic, and environmental impacts."
	NM Admin Code, Title 20, Chap 2, Part 99	This rule implements the Clean Air Act for New Mexico as it applies to the conformity of transportation plans, programs, and projects to the State Implementation Plan.
New York	New York State Consolidated Laws Article 2, Section 14a.	In order to help preserve agricultural lands, public park and recreational lands, wildlife and waterfowl refuges and historical sites, the commissioner of the department of transportation planning is required to "cooperate and consult with the commissioners of agriculture and markets, parks and recreation, environmental conservation and health in developing transportation plans and programs so that such programs include measures to maintain or enhance the desirable natural characteristics of the land traversed." The cooperation and consultation is to be effected and implemented by memoranda of understanding between the commissioner of transportation and each of the aforementioned commissioners.
	New York State Department of Transportation Environmental Policy	Environmental Policy recognizes an obligation to preserve, protect, and enhance the environment and to proactively protect, conserve, restore, and enhance important natural and man-made resources in the planning of facilities. The document also states that it is the policy of the Department of Transportation to seek opportunities to contribute to the advancement of State and federal environmental policies, programs and objectives through close coordination and communication with State and federal resource agencies.
	NYS Environmental Quality Review Act (SEQRA) - Statutory Authority: Environmental Conservation Law Sections 3-0301(1)(b), 3-0301(2)(m) and 8-0113	In New York State, most projects or activities proposed by a state agency or unit of local government require an environmental impact assessment as stipulates by the NYS Environmental Quality Review Act (SEQRA). SEQRA requires the sponsoring or approving governmental body to identify and mitigate significant environmental impacts of the activity it is proposing or permitting. To standardize environmental assessments, Environmental Assessment Forms (EAFs) and special guidance documents are utilized. After completing an EAF, the lead agency determines the significance of an action's environmental impacts, and then decides whether to require (or prepare) an Environmental Impact Statement and whether to hold a public hearing on the proposed action.

Oregon, cont'd	Transportation System Planning (TSP) Guidelines 2001	These guidelines outline the expectations of the state planning goal regarding transportation. Included in this document are expectations regarding the type of environmental work that is needed during the planning process. One key addition to these guidelines is the emphasis placed on defining purpose and need in the development of the plan. A Purpose and Need Statement is a fundamental requirement when developing a plan that will require future NEPA documentation.
	NEPA-Refinement Planning Process	ODOT has adopted a policy of doing NEPA tiered documents called Location EIS for large transportation proposals still in the planning process. Test criteria were created to determine the conditions under which ODOT would be willing to commit serious environmental resources during the planning stage. This process is still in the experimental stages at ODOT.
Pennsylvania	Executive Order 1999-1	In January 1999, Governor Tom Ridge issued this executive order requiring all commonwealth agencies to identify laws, regulations, practices, and policies, including the disbursement of public funding that will advance the Commonwealth's land use objectives.
	Acts 67 and 68	These acts, signed into law in 2000, amended the municipal planning code to allow multi-municipality planning for the first time. All counties are required to have a comprehensive land use plan under the new regulations. State agencies are allowed to consider municipality and county plans and zoning when they make decisions on permitting and funding.
Rhode Island	Rhode Island Comprehensive Planning and Land Use Act of 1988 (Rhode Island General Laws, 45-22.2)	This act requires cities and towns to develop a comprehensive plan that includes the elements of land use; housing; economic development; natural and cultural resources; services and facilities; open space and recreation; and circulation. The goals of this act include promoting a more prosperous economic climate, promoting the protection of natural, historic, and cultural resources; promoting the preservation of open space and recreational resources; promoting a balance of housing choices; encouraging the involvement of citizens in the development of the plans; and encouraging the use of innovative development regulations and techniques that promote the development of land suitable for development while protecting natural, cultural, historical, and recreational resources, and achieving a balanced pattern of land uses.
	Rhode Island General Laws 42-11-10: Statewide Planning Program	Section 42-11-10 of the General Laws of Rhode Island directs the Statewide Planning Program to prepare, adopt, and amend strategic plans for the development of the state's human, economic and physical resources. Section 42-11-10(b) and (d) establish a state planning council to provide policy advice and guidance to state planning activities. Under this law, a State Guide Plan must be prepared, consisting of elements that address land use; physical development and environmental concerns; economic development; energy supply, access, use, and conservation; and human services. The State Guide Plan contains the Ground Transportation Plan, which is Rhode Island's long range transportation plan. The DOT must act within the guidance set forth by all elements of the Guide Plan.

Texas, cont'd	*Texas Administrative* Code, Title 43, Part 1, Chapter 13, Subchapter A, Rule §15.8 -- Statewide TIP	*The STIP will only be approved by the commission if it meets the* requirements of facilitating "economic and social prosperity through the efficient movement of people and goods" and protecting, when feasible, and enhancing, where practicable, the environment in transportation activities.
	Texas Administrative Code, Subchapter A, Rule §15.3 -- Organization, Structure, and Responsibilities of Metropolitan Planning Organizations	This rule states that "the MPO shall not approve any metropolitan transportation plan or transportation improvement program which does not conform with the SIP (State Implementation Plan), as determined in accordance with EPA conformity regulations." In non-attainment areas, the MPO is to coordinate the development of the transportation plan with the SIP development process, including the development of any transportation control measures (TCMs).
	TAC Title 31, Part 16, Chapters 501, 503, 505, 506	Coastal Zone Management (project development)
	Title 30, Part 1, Chapter 213	Edwards Aquifer (project development)
	Title 13, Part 2, Chapter 26.15	Texas Historical Commission (project development)
Vermont	Title 19, Chapter 1, Section 10i V.S.A	Long Range Transportation Systems Plan should be developed pursuant to the planning goals and processes set forth in Act 200 of the Acts of 1988.
	Title 10 VSA Chapter 37 Section 905 (7) "The Vermont Wetland Rules"	The Vermont Wetland Rules protect wetlands which are determined to be "so significant that they merit protection". They establish criteria for evaluating wetland significance as well as establish allowed wetland uses and provide for conditional wetland uses. Conditional uses require a Determination by the Secretary of the Agency of Natural Resources (ANR). A Conditional Use Determination (CUD) will only be issued upon conclusion that the proposed activity will have no undue adverse effect on protected functions of the wetland or that the impacts are sufficiently mitigated.
	Title 10 VSA Chapter 41 "Regulation of Stream Flow"	Chapter 41 of the VSA protects all waters of the State and establishes the ANR as Certifying Agency for Section 401 of the Federal Clean Water Act. Consultation with the ANR prior to altering or modifying the course, current or cross-section of waters of the State is required. Consultation is accomplished through the ANR Stream Alteration Permit (SAP) process.
	Title 10 VSA Chapter 151 "The Land Use and Development Law, Act 250"	Act 250 Was established "to protect and conserve the lands and the environment of the state and to insure that these lands and environment are devoted to uses which are not detrimental to the public welfare and interests". It established "a state environmental board and district environmental commissions ... to regulate the use of lands" and Conditions and Criteria for the issuance of permits by the district commissions. Act 250 is applicable to "Construction by state or local government if the project involves more than 10 acres" and also applies to "substantial changes" in pre-existing developments.

Virginia	33.1-23.03 VA Code	Requires a 20-year Statewide Transportation plan that provides "consideration of projects and policies affecting all transportation modes" and promotes "economic development" and "environmental quality".
	Chesapeake Bay Agreement (Chesapeake 2000)	This agreement applies to states of Virginia, Maryland, Pennsylvania, and the District of Columbia. It is a commitment to nurture and sustain a Chesapeake Bay Watershed Partnership through living resource protection and restoration; vital habitat protection and restoration; water quality protection and restoration; sound land use; and stewardship and community engagement. Several specific goals relating to transportation are set forth, one of which being: "By 2002, the signatory jurisdictions will promote coordination of transportation and land use planning to encourage compact, mixed use development patterns, revitalization in existing communities and transportation strategies that minimize adverse effects on the Bay and its tributaries."
Washington	Statewide Multimodal Plan Statute (RCW 47.06.040)	Directs WSDOT "to identify and document potential affected environmental resources including, but not limited to, wetlands, storm water runoff, flooding, air quality, fish passage, and wildlife habitat" during the development of the Washington Transportation Plan (WTP).
	Clean Air Washington Act (CAWA) (RCW 70.94)	CAWA requires transportation plans, programs, and projects to be consistent with the SIP in areas where the federal air quality standards are not met. It gives responsibility for determining conformity to the state, local government, or MPO that is developing the transportation plan, program, or project.
	Washington State Transportation Commission Policy Catalogue	One of eight policy objectives is to "meet environmental responsibilities". This objective includes minimizing and avoiding "air, water and noise pollution; energy usage; use of hazardous materials; flood impacts; and impacts on wetlands and heritage resources from transportation activities". It also includes, when consistent with other priorities and practical, protecting, restoring, and enhancing "fish and wildlife habitats and wetlands impacted by transportation facilities".
	Environmental Permit Streamlining Act (RCW 47.06)	Adopted in May 2001, this act established an interagency Transportation Permit Efficiency and Accountability Committee (TPEAC) that is responsible for creating a sustained focus on achieving transportation and environmental goals of the state and for streamlining the environmental permitting process for transportation projects.
	Transportation Commission and State Transportation Department State Environmental Policy Act Rules (WAC 468-12)	Integrates the policies and procedures of SEPA into the DOT's programs, activities, and actions. With regards to timing (WAC 468-12-055), "The SEPA process shall be completed before the transportation department is irrevocably committed to a particular course of action. At the same time, the SEPA process should not be undertaken until a proposal is sufficiently definite to permit meaningful environmental analysis."
	State Environmental Policy Act (SEPA) (RCW 43-21C)	Directs state and local decision makers to consider the environmental consequences of their actions

Wisconsin cont'd	Wisconsin Administrative Code, Trans 400, Environmental Policy Act Procedures for Department Actions	Trans 400 states that the policy of the Department of Transportation is to "strive to protect and enhance the quality of the human environment in carrying out its basic transportation mission and consider pertinent environmental factors consequential to any proposed action" beginning in the planning stage of development.
		It requires the DOT to conduct "Systems-Plan Environmental Evaluations" (SEEs) on all statewide transportation plans. The SEE examines potential environmental impacts at the system level over the entire planning period (usually 20-25 years). To date, SEEs have been completed for the Statewide Multimodal Plan (Translinks 21), the State Highway Plan, and the State Airport Plan. Currently, SEEs are being developed for the State Rail Plan and the update of Translinks 21.

Methods/Tools for Considering Environmental Factors in Transportation Planning

State DOTs identified data trend analysis as the most frequently used method or tool for considering environmental factors in statewide planning. Sixty-six percent (66%) of respondents use data trend analysis. The least frequently used tools are ecosystem models (2%). Overall, ninety-one percent (84%) of the respondents indicated that they are aware of at least one method/tool that has been used when environmental factors have been considered in the statewide planning process. Figure C-2 summarizes the percentages of respondents using various methods and tools for considering environmental factors in the planning process.

Current Status of Environmental Data

The majority (53%) of state DOTs believe that only some of the supporting environmental data currently exists for planning purposes. Table C.2 summarizes the overall status of environmental data for planning purposes according to the state DOTs. Of the environmental factors, the state DOTs indicated that the most data exists for air quality analyses. Historic properties and land use data followed air quality data in availability. Data required to analyze aesthetics was the least available according to the state DOTs. Figure C-3 summarizes the current status of supporting environmental data by factor according to the respondents to the statewide survey.

Table C.2 and Figure C-3 about here

Data Sources

The statewide survey respondents indicated that the majority of environmental impact data (38%) for use in the transportation planning process comes from outside the state transportation agency. Other sources of data included "historical data from our agency", "historical data from another agency", and "new data collection". A summary of overall data sources can be found in Table C.3.

Environmental justice and hazardous wastes have the highest percentages of data already in existence, with 95.8% and 95.3% of data, respectively, as historical data or data from another group. Most historical data from within the state DOTs is for socioeconomic considerations (37%) followed by air quality (29%) and environmental justice (29%). Wetlands historic data (47%), followed by historic data on environmental justice and hazardous wastes (both 43%) is most often acquired from agency outside the state DOT. The most pressing need for new data is the areas of socioeconomic considerations and water quality. It should be noted that even though the most in-house data exists for socioeconomic considerations and air quality, approximately twenty-eight percent (28%) of socioeconomic data and twenty-six percent (26%) of water quality data must come from new data collection. Sources of data for specific environmental factors can be found in Figure C-4.

- Competing priorities that distract from environmental issues
- No regulations requiring the consideration of environmental factors
- Lack of data for considering environmental factors
- Lack of appropriate analysis tools for considering environmental factors

On average, the respondents identified that 1.6 major obstacles were faced by agencies in incorporating environmental consideration into transportation planning. Of these obstacles, competing priorities seems to be the biggest obstacle to incorporating environmental considerations in the transportation planning process, with sixty-one percent (61%) of the respondents indicating that it was a major obstacle. Fifty-three percent (53%) of the respondents indicated that lack of appropriate analysis tools was a major obstacle, thirty-nine percent (39%) indicated that lack of data was a major obstacle, and seven percent (7%) of respondents indicated that no regulations was a major obstacle in considering environmental factors in transportation planning. These statistics are summarized in Figure C-6.

Other obstacles identified by the statewide survey respondents include:

- The statewide plan is a policy plan – environmental data is limited and difficult to incorporate at the policy level
- Lack of agreement on which environmental factors to include in the plan

Figure C-6 about here

Incorporating Environmental Factors Earlier in Project Development

Eighty-four percent (84%) of the respondents to the statewide survey indicated that they have taken action to promote the consideration of environmental factors earlier in the project development process of implementing agencies, while only three percent (3%) indicated that they have not taken action to incorporate environmental factors earlier in project development.

If environmental factors were considered earlier in the project development process, respondents were asked to choose from a list of actions that they may have taken. These actions included:

- Defined purpose and need earlier in the planning process
- Developed software programs to better manage environmental analyses
- Entered into agreements with environmental resource agencies
- Paid for environmental resource agency staff to work with my agency
- Hired new DOT staff targeted at environmental impact assessment
- Implemented changes to the organization of my agency to better handle environmental issues
- Developed new standard operating procedure that require earlier consideration
- Implemented a fatal flaw assessment that identifies environmental problems early on

factors earlier. Figure C-8 summarizes the percentage of respondents choosing each reason as important.

Figure C-8 about here

Examples of Where Considering Environmental Factors Earlier Resulted in Benefits

Forty-eight percent (48%) of the respondents to the statewide survey could identify examples from their agency of where considering environmental factors earlier in project development resulted in benefits.

Metropolitan Survey

The metropolitan survey was sent out to 340 members of the Association of Metropolitan Planning Organizations. A total of 45 responses were received – a 13.2% response rate.

Legislation/Regulations

The responses indicate that sixty-seven percent (67%) of MPOs are aware of legislation and/or regulations that require the consideration of environmental factors in the development of the metropolitan transportation plan, while only twenty-two percent (22%) indicated that they are unaware of any rules that require the consideration of environmental factors.

Importance of Environmental Factors in Metropolitan Transportation Planning

In the update of the most recent metropolitan transportation plans, the majority, twenty-four percent (24%), of MPOs indicated that the importance of environmental factors lied between a very important and a somewhat important consideration (see Table C.4). Eleven percent (11%) indicated that environmental factors were a very important consideration in the development of the most recent metropolitan transportation plan. As indicated by Table C.4 and Figure C-9, the MPOs indicated that, overall, 10 years in the future, environmental factors will have more importance in the update of the metropolitan transportation plan. Twenty-five (25%) of respondents *indicated that environmental factors will be very important 10 years from now. The* majority of MPOs indicated that the importance of environmental factors will lie somewhere between somewhat important and very important in the update of their metropolitan transportation plan 10 years in the future.

Table C.4 and Figure C-9 about here

Overall, land use was ranked the most important environmental factor for consideration in transportation planning by the respondents to the metropolitan survey. Land use was considered the most important factor in the update of the most recent metropolitan plan, as well as for the development of the metropolitan plan 10 years in the future (see Figure C-9). Air quality, socioeconomic considerations, and

The metropolitan survey respondents indicated that one hundred percent (100%) of the environmental data for climate, water quality, biological, historic properties, and community cohesion considerations is in existence as historical data or data from another group. The most historical data from within the MPOs exists for noise and energy consumption (30%). The most historical data acquired from another agency is community cohesion data (52%), followed by data on climate and environmental justice (50%). The most new data collection is needed for air quality (29% of data) and cultural considerations (23% of data). Sources of data for specific environmental factors can be found in Figure C-12.

Figure C-12 about here

Performance Measures

Forty-three percent (43%) of MPOs responded that they do not use performance measures to monitor the performance of the transportation system or of their own progress toward achieving program goals. Twenty-one percent (21%) indicated that they do use performance measures, however they do not include environmental factors in the measures. Thirty-six percent (36%) of the respondents indicated that they do include environmental factors in their performance measures.

Interaction with Groups During the Planning Process

The respondents were asked to indicate the level of interaction that occurs between their agency and the following individuals/groups on environmental issues during the planning process:

- Federal environmental resource agency
- Federal transportation agency
- Governor's office
- State environmental resource agency
- Other state agencies
- Environmental advocacy groups: National office
- Environmental advocacy groups: State/Local office
- MPOs
- Public interest groups (other than environmental)

Twenty-eight percent (28%) of the respondents to the metropolitan survey indicated that they interact with these individuals/groups only during times of public concern. Twenty-seven percent of MPOs indicated that they interact often with the aforementioned groups, twenty-four percent (24%) indicated that they interact frequently with these groups, and fifteen percent (15%) indicated that they never interact with the previously mentioned groups/individuals on environmental issues during the planning process.

Of the various individuals and groups, the federal transportation agency is interacted with most frequently during the planning process. The state, local and national offices of

- Defined purpose and need earlier in the planning process
- Developed software programs to better manage environmental analyses
- Entered into agreements with environmental resource agencies
- Paid for environmental resource agency staff to work with my agency
- Hired new DOT staff targeted at environmental impact assessment
- Implemented changes to the organization of my agency to better handle environmental issues
- Developed new standard operating procedure that require earlier consideration
- Implemented a fatal flaw assessment that identifies environmental problems early on
- Used environmental experts to identify environmentally sensitive areas
- Adopted the approach of developing a EIS/EA as part of earlier studies

Sixty-eight percent (68%) of respondents who do consider environmental factors earlier in the project development process have defined the purpose and need earlier in the planning process. Forty-three percent (43%) have used environmental experts to identify environmentally sensitive areas. Figure C-15 shows the percentage of respondents (who have taken action to promote the consideration of environmental factors earlier) taking each action.

Figure C-15 about here

Benefits of Incorporating Environmental Factors Earlier in Project Development

The respondents were asked to choose the one most important reason for incorporating environmental factors earlier in project development, as well as the other important reasons. The following is the list of reasons provided for incorporating environmental factors earlier:

- Shortens time to project implementation
- Reduces amount of resourced needed for project
- Engages environmental resource agencies earlier
- Reduces level of potential public controversy
- Results in better decisions
- Helps develop a constituency for a project
- Improves our agency image
- Links planning better with project development

When asked which one reason they thought was the most important reason for incorporation environmental factors earlier in project development, thirty-six percent (36%) of the respondents chose "shortens time to project implementation" and "results in better decisions".

Importance of Environmental Factors in Planning

In the update of the most recent statewide and metropolitan transportation plans, the majority of environmental organizations indicated that environmental factors should have been a very important consideration, with 35% and 34% of respondents ranking environmental considerations very important for the statewide and metropolitan plans respectively (see Table C.7).

Again, the majority of respondents indicated that environmental considerations should be very important in the update of the statewide and metropolitan transportation plans 10 years from now. Forty percent (40%) of respondents indicated that environmental factors should be very important in the update of the statewide transportation plan 10 years in the future, and increase from the percent of respondents who believed environmental factors should have been very important in the most recent update of the statewide plan. However, only 32% of respondents indicated that environmental factors would be very important in the development of metropolitan plan 10 years from now, a slight decrease from percent of respondents who indicated that environmental factors should have been very important in the most recent update of the transportation plans.

Table C.7 about here

Important Factors in the Development of Transportation Plans

Overall, air quality was ranked the most important environmental factor for consideration in transportation planning by the respondents to the environmental survey. Air quality was considered the most important factor in the update of the most recent statewide plan, as well as for the development of the statewide plan 10 years in the future (see Figure C-17). Similarly, air quality was ranked the most important factor in the update of the most recent metropolitan plan and for the development of the metropolitan plan 10 years in the future (see Figure C-18). Erosion and water quality were identified as the environmental factors that should have been the next most important in the most recent update of the statewide transportation plan. Erosion and aquatic ecology were identified as the most important environmental factor next to air quality for the development of the statewide transportation plan 10 years in the future.

Figures C-17 and C-18 about here

Erosion, water quality, and storm water runoff were identified as the next most important environmental factors to air quality in the most recent update of the metropolitan transportation plan. Erosion and storm water runoff were again identified as the most important factors next to air quality for the update of the metropolitan transportation plan 10 years in the future.

Another environmental factor considered in the transportation planning process identified by the environmental agencies was greenhouse gas emissions.

Environmental Organization Roles

The following is a list of roles that environmental agencies have played in the promotion of the consideration of environmental factors in the statewide and metropolitan transportation planning process:

- We are a local air quality agency and are very active in the MPO process
- We provide the air quality data
- Our agency promotes an 'Environmental Ethic', which emphasizes that 'consideration of environmental factors' is not just a requirement, but an expectation that adds value to transportation decisions and actions.
- A limited amount - we need to be more participative
- We worked with the local planning agency, TMACOG, to stop construction of a new outer belt that would have promoted sprawl.
- Riparian buffers and surface water quality - surveys Air quality - public information and outreach Storm water runoff/CSOs/SSOs and flood recovery - participation in cleanup and public information
- We have provided expertise for air quality analysis.
- Oregon DEQ worked to gain representation on MPO TAC and Policy committees to support environmental considerations in transportation decision-making. DEQ supported adoption of a strong Transportation Planning Rule.
- We comment as an interested local county air pollution control district on transportation planning efforts and analytical efforts.
- The Dept. of Ecology sits on various transportation committees relating to how resource agencies play a role in transportation planning and permitting. We participate in "Reinventing NEPA" through three pilot projects where we become involved at the NEPA planning stage.
- The Office of Air Resources has a consultative role along with the Department of Transportation, in designing the conformity analysis.
- Participation in conformity process, participation in CMAQ project selection process
- Support where possible and promote.
- Review findings/demonstrations. Act as resource partner in environmental protection.
- We regulate air and water quality. Our role is large relative to air quality in metropolitan transportation planning. Water quality role is only in erosion control.

Interaction with Groups During the Planning Process

The respondents were asked to indicate the level of interaction that occurs between their agency and the following individuals/groups on environmental issues during the planning process:

- Federal environmental resource agency
- Federal transportation agency

Obstacles in the Planning Process

The environmental organizations were asked to identify which major obstacles they thought that agencies faced in incorporating environmental considerations into statewide and metropolitan transportation planning. The major obstacles they were given to choose from included:

- Competing priorities that distract from environmental issues
- No regulations requiring the consideration of environmental factors
- Lack of data for considering environmental factors
- Lack of appropriate analysis tools for considering environmental factors

On average, the respondents identified that 1.6 major obstacles were faced by agencies in incorporating environmental consideration into transportation planning. Of these obstacles, competing priorities seems to be the biggest obstacle to incorporating environmental considerations in the transportation planning process, with eighty-five percent (85%) of the respondents indicated that it was a major obstacle. Twenty-three percent (23%) of respondents indicated that no regulations was a major obstacle, fifteen percent (15%) indicated that lack of data was a major obstacle, and thirty-eight percent (38%) of the respondents indicated that lack of appropriate analysis tools was a major obstacle in considering environmental factors in transportation planning. These statistics are summarized in Figure C-22.

Figure C-22 about here

Other obstacles identified by the environmental organizations include:

- Engaging the public in weighing environmental factors
- Lack of interest/concern on the part of federal transportation agencies (state and federal)
- Data too broad at state/federal levels – need local information

Benefits of Incorporating Environmental Factors Earlier in Project Development

The respondents were asked to choose the one most important reason for incorporating environmental factors earlier in project development, as well as the other important reasons. The following is the list of reasons provided for incorporating environmental factors earlier:

- Shortens time to project implementation
- Reduces amount of resourced needed for project
- Engages environmental resource agencies earlier
- Reduces level of potential public controversy
- Results in better decisions
- Helps develop a constituency for a project

Project Home Survey Home

Survey for Statewide Transportation Planners

Survey recorded: Wed Jul 24 15:05:29 2002
PersonID: nnj7qp
SessionID: 010cc875598cdb39213b2450f9b3b29a
Remote IP Addr:
Browser: Mozilla/4.0 (compatible; MSIE 5.01; Windows NT 5.0)

Survey Consent

This survey will assess how environmental factors are being integrated into statewide and metropolitan transportation planning. Your answers will help characterize how different organizations currently incorporate environmental factors in transportation planning. We plan to publish research articles and may highlight individual responses, including agency name, but will not associate your individual identity with any response.

- ○ No. I do not agree to participate
- ◉ Yes, I agree to participate

Statewide Transportation Planning Questions

1. How important were the following environmental factors when your state transportation plan was most recently

Very Important		Somewhat Important		Not very important	
○	○	◉	○	○	Aesthetics/visual
○	○	◉	○	○	Air quality
○	○	◉	○	○	Aquatic ecology (habitats/animals)
○	○	◉	○	○	Biological (other than aquatic/terrestrial)
○	○	◉	○	○	Climate
◉	○	○	○	○	Community Cohesion
○	◉	○	○	○	Cultural
○	◉	○	○	○	Energy consumption
◉	○	○	○	○	Environmental justice
○	○	◉	○	○	Erosion and sedimentation
○	◉	○	○	○	Farmland conversion
○	○	◉	○	○	Hazardous wastes
○	○	◉	○	○	Historic properties
○	◉	○	○	○	Human health
◉	○	○	○	○	Land use
○	○	◉	○	○	Noise
○	◉	○	○	○	Socioeconomic
○	○	◉	○	○	Storm water runoff
○	○	◉	○	○	Terrestrial ecology (habitats/animals)
					Water quality

4. Who is a good contact in your agency to discuss your agency's experience with incorporating environmental factors into statewide transportation planning?
(A name, title, and phone number will be greatly appreciated)

5. When environmental factors have been considered in your state's transportation planning process, which of the following methods or tools have been used? (Check all that apply).

- [x] Community impact assessment methods
- [x] Data trend analysis
- [ ] Ecosystem modeling
- [ ] Environmental impact-specific models (e.g., air quality models)
- [x] Expert elicitation
- [x] Focus groups
- [x] Geographic information systems (GIS)
- [ ] Global positioning systems (GPS)
- [x] Overlay maps
- [x] Public or expert surveys
- [ ] Remote sensing
- [ ] Risk Assessment
- [ ] Socioeconomic impact assessment
- [ ] Other
- [ ] Other

6. If you use environmental impact-specific models, which ones do you use?
(Please list in the space provided)

- [ ] **Please check this box if environmental factors have never been considered in your state's transportation planning process.**

7. For those impacts that have been considered during the statewide transportation planning process, please indic the sources of data used for any analyses that were undertaken.

Historical data from my agency	Historical data from another agency	Data from another group	New data collection	
☐	☑	☐	☐	Air Quality
☐	☑	☐	☐	Aesthetics/visual
☐	☑	☐	☐	Air quality
☐	☑	☐	☐	Aquatic ecology (habitats/animals)

◉	○	○	Noise
◉	○	○	Socioeconomic
○	◉	○	Storm water runoff
◉	○	○	Terrestrial ecology (habitats/animals)
◉	○	○	Water quality
◉	○	○	Water quantity (ground and surface)
◉	○	○	Wetlands
○	○	○	Other
○	○	○	Other

9. If your agency has identified performance measures to either monitor the performance of the transportation system or of its own progress toward achieving program goals, are environmental concerns part of these performance measures?

○ We don't use performance measures

○ We use performance measures, but environmental factors are not part of the measures we use

◉ We use performance measures, and the following environmental factors are incorporated into our measures *(Please list in the space provided)*

Sustainability - Environmental related (fuel usage per person and fuel usage per ton moved)
Sustainability - Social Equity (Emissions, Noise, Species,

10. When environmental factors are condisered during the statewide transportation planning process, how would y describe the level of interaction that occurs between your agency and the following individuals/groups on environr issues?

Very often during the planning process	Often during the planning process	Only at time when an environmental issue became a public concern	Never	
◉	○	○	○	Federal environmental resource agency
◉	○	○	○	Federal transportation agency
○	○	◉	○	Governor's office
◉	○	○	○	State environmental resource agency
○	◉	○	○	Other state agencies
○	○	◉	○	Environmental advocacy groups: National office
○	◉	○	○	Environmental advocacy groups: State/local office
◉	○	○	○	MPOs
○	○	◉	○	Public interest groups (other than environmental)
○	○	○	○	Other
○	○	○	○	Other

11. In the space below, please indicate the best example from your agency of how you have incorporated environmental considerations into statewide transportation planning. In addition, please provide us with a contact person name and phone number.

○	☑	
◉	☐	Results in better decisions
○	☑	Helps develop a constituency for a project
○	☑	Improves our agency image
○	☑	Links planning better with project development
○	☐	Other
○	☐	Other

15. Does your agency have any examples of where considering environmental factors earlier in project development resulted in any of the benefits listed in the previous question?

○ No

◉ Yes, the following are good examples
(Please include contact person/phone number)

please contact me to discuss further

☑ **Thank you for completing this survey. We will be happy to share the results with you. Please check the box if you would like a copy of resulting publications(s).**

II. DUTIES OF REQUESTING AGENCY

REQUESTING AGENCY will:

1.) Invite PROVIDING AGENCY participation and consultation about state highway plans and projects where there is likely environmental effects assigned to PROVIDING AGENCY jurisdiction by law. Such invitation will have a minimum of 10 working days notice.

2.) Request environmental information that is needed for REQUESTING AGENCY project development or environmental documents that is reasonably available from PROVIDING AGENCY.

3.) Submit environmental documents to PROVIDING AGENCY for review and comment.

4.) Apply for permits or approvals when required by law or rule.

5.) Abide by permit or approval requirements.

6.) Evaluate the quality and timeliness of PROVIDING AGENCY services provided under this agreement. Such evaluation will be shared with PROVIDING AGENCY.

7.) Initiate prompt resolution of any dispute with PROVIDING AGENCY consistent with the June 1999 " Memorandum of Understanding" between REQUESTING AGENCY and Department of Natural Resources.

8.) Consider time extensions for PROVIDING AGENCY duties based on responsible requests and project schedules as determined by REQUESTING AGENCY'S Authorized Representative.

III. CONSIDERATION AND TERMS OF PAYMENT

A. Consideration for all services performed and goods or materials supplied by PROVIDING AGENCY pursuant to this Agreement shall be paid by REQUESTING AGENCY on a lump sum basis as follows:

Total Agreement Amount: $400,000.00

Upon receipt of each quarterly report, PROVIDING AGENCY will invoice REQUESTING AGENCY in the amount of $50,000.00. Payments will be made by REQUESTING AGENCY upon approval and acceptance of quarterly report by REQUESTING AGENCY'S Authorized Representative. Providing that the final quarterly report can be submitted and invoiced as early as May 15,2003 so that the total of all 8 payments will be completed within fiscal years 2002 and 2003.

B. Terms of Payment Payment shall be made by REQUESTING AGENCY within 30 days after PROVIDING AGENCY has presented invoices for services performed or goods or materials supplied to REQUESTING AGENCY. All services provided by PROVIDING AGENCY pursuant to this Agreement shall be performed to the satisfaction of REQUESTING AGENCY, as determined by its Authorized Representative.

XI. COORDINATION COMMITMENTS: The AGENCIES commit to a comprehensive coordination process. Both AGENCIES recognize that the objectives of this Interagency Agreement can best be realized through coordination and cooperation between their respective staffs during the planning and development stages of projects, and through a cooperative problem solving approach in the environmental review and permitting programs. Neither AGENCY will unduly criticize, make unwarranted claims or over generalizations not supported by facts, science or seasoned professional opinion about the plans, comments or professional opinions of the other AGENCY. The PROVIDING AGENCY will not publicly claim or assert credit for project design changes or mitigation measures of the REQUESTING Agency.

XII. AUDIT Pursuant to Minnesota Statutes Section 16C.05, subdivision 5, the books, records, documents, and accounting procedures and practices relevant to this Agreement will be subject to examination by either agency=s auditor and the Legislative Auditor, for a minimum of six years.

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed intending to be bound thereby.

PROVIDING AGENCY'S REPRESENATIVE

By:_____
Steven Morse
Title: Deputy Commissioner
Department of Natural Resources

Date:_____

REQUESTING AGENCY'S REPRESENATIVE

By:_____
Merritt H. Linzie,
Title: Chief Environmental Officer
Office of Environmental Services
Minnesota Department of Transportation

Date:_____

Mn/DOT Office of Contract Management

By:_____

Date:_____

Concurrence Points

1) Project Purpose and Need - Prior to issuance of the Scoping Document/Draft Scoping Decision Document.

2) Alternatives to be Carried Forward to Detailed Study - Agency scoping meeting during the comment period on the Scoping Document/Draft Scoping Decision Document prior to issuance of Scoping Decision Document.

3) Selected Alternative - After issuance of the Draft Environmental Impact Statement (EIS) and prior to announcement of the Preferred Alternative.

B. MnDOT will provide supporting data, technical studies, and other needed information to the undersigned not less than thirty (30) calendar days in advance of a scheduled Concurrence Point meeting.

C. At each Concurrence Point meeting, or for any additional project meeting found by mutual consensus to be necessary, the undersigned parties will define and agree to the type(s) of information, data, evaluations, technical studies, etc., necessary to allow a reasonably informed decision at the next Concurrence Point or other project meeting.

D. Not more than fifteen (15) days after each Concurrence Point or other meeting, MnDOT will distribute meeting minutes. Each party will correct errors of fact or of significant misunderstanding and submit its corrections to MnDOT not more than fifteen (15) days after its receipt of the draft minutes from MnDOT.

E. Final minutes will be prepared by MnDOT and distributed not more than thirty (30) days after its receipt of requests for corrections to the minutes.

F. Concurrence can be stated by any party during any Concurrence Point meeting, and the minutes will document such concurrence. If unable to give concurrence during the meeting, the party will provide a preliminary explanation of the reasons for withholding concurrence.

G. Any party unable to give its concurrence after final minutes are distributed must give written notification to each of the undersigned not more than fifteen (15) days after receipt of the final minutes from MnDOT explaining the reasons for withholding concurrence and to allow consideration of its concerns by the other parties.

H. Each party agreeing to concur will provide written concurrence, if not already documented in the meeting minutes, to MnDOT not more sixty (60) days after receipt of the final meeting minutes.

I. For all other major project activities not requiring concurrence, e.g., scoping, alternatives development, draft NEPA document review, etc., the roles and responsibilities of each party shall conform to those defined in the Flow Diagram of the March, 1994 Concurrent NEPA/404 Processes Guidance. Parties to this LOU not signatory to the 1994 agreement shall review and provide comments consistent with its applicable agency authorities and regulations. The undersigned agree that review comments for any of these activities or draft documents shall be provided to MnDOT not more than thirty (30) days after receipt of a request for review.

Schedules:

- Information 30 days before concurrence point
- Identify information needed at next concurrence point
- Minutes 15 days after concurrence point meeting; corrections due in 15 days
- Final minutes within 30 days of corrections
- Oral concurrence noted in minutes; explain reason for not concurring
- Non- concurrence in writing to all members within 15 days of final minutes with reasons
- Written concurrence in minutes or separately within 60 days of final minutes
- Respond to reviews within 30 days
- After final EIS; necessary information and outstanding issues for permits
- Dispute resolution process
- Concurrence will not be revisited without significant new information
- Time extension not to exceed 30 days by Mn/DOT

WHEREAS, the OSA has authority to approve licenses for archaeological investigations on state lands pursuant to Minnesota Statutes 138.31 – 138.42 and 307.08, and grants Mn/DOT permission to conduct archaeological investigations on all lands or waters owned, leased by or subject to the paramount right of the state or its subdivisions, as well as on lands impacted by publicly-funded development projects, as needed in connection with highway projects involving Section 106 review; and

WHEREAS, FHWA and Mn/DOT are committed to the design of transportation systems that: (1) achieve a safe and efficient function appropriately placed within the Minnesota context; (2) avoid, minimize and mitigate adverse effects on historical and cultural resources; (3) recognize that investment in these historic, archaeological, and cultural resources is critical to Minnesota's continued growth and prosperity; and (4) respond to the needs of Minnesota communities; and

WHEREAS, FHWA, the Council, the OSA, the Corps, the MHS, Mn/DOT, and the SHPO aspire to engage in meaningful, long term planning for the protection of historic and archaeological properties and, toward that end, desire to: (1) develop a comprehensive and efficient process for all Section 106 undertakings; (2) simplify procedural requirements to the maximum extent possible; (3) eliminate unnecessary paperwork; (4) affirm the role of SHPO, MHS, and OSA to the extent required; (5) devote a larger percentage of time and energies to identifying transportation-related concerns that may affect historic and archaeological properties; and (6) continue creating innovative programs to address those problems; and

WHEREAS it is desirable to integrate and streamline project reviews under parallel state and federal historic preservation and environmental laws.

NOW, THEREFORE, the FHWA, Mn/DOT, the Council, the Corps, the OSA, the MHS, and the SHPO agree that the Federal-Aid-Highway Program shall be administered in accordance with the following stipulations to satisfy the FHWA Section 106 responsibility for all aspects of the program.

STIPULATIONS

FHWA will ensure that the following measures are carried out:

1. **Applicability and Scope.** This PA sets forth the process by which FHWA, with the assistance of Mn/DOT, will meet its responsibilities under Section 106 of the NHPA and regulations set forth in 36 CFR 800 as amended adopted to implement that act. For the purposes of this PA, the definitions for terms appearing in 36 CFR 800.16(a) through (y) inclusive shall be employed whenever applicable.

(A) Applicability. This PA shall apply to all FHWA undertakings administered under its Federal-Aid Highway Program in Minnesota.

(B) Scope. The objective of this PA is to render more efficient the methods by which FHWA and Mn/DOT review individual undertakings that may affect historic properties and to establish the process by which FHWA, the Council, the SHPO, the OSA, the Corps, the MHS, and interested persons will be involved in any such review.

2. **General Requirements.** In compliance with its responsibilities under the NHPA and as a condition of its award of any assistance under the Federal-Aid Highway Program to Mn/DOT, FHWA shall require that Mn/DOT carry out the requirements of 36 CFR 800 inclusive, all applicable Council standards and guidelines, or the requirements set forth in this PA, for all FHWA undertakings. FHWA will insure that Mn/DOT observes the following requirements.

A. Types of Documentation. The required documentation supporting findings of effect and eligibility to the NRHP will be incorporated into Mn/DOT's electronic database system. Mn/DOT shall make available to the FHWA, SHPO and OSA copies of all identification, evaluation, treatment and data recovery reports, survey forms, digital survey information, and other relevant resource information as they are generated and as required under provisions of applicable Minnesota statutes and OSA policies.

B. GIS Systems. Current Mn/Model procedures for incorporating pertinent documentation into GIS systems will be used. Mn/DOT, SHPO, Corps, OSA and the MHS will share technology and information providing mutual access to site data, historic contexts, and other information pertaining to cultural resource sensitivity analysis and/or site predictive modeling.

4. **Requirements for Project Review by FHWA and Mn/DOT** For all FHWA undertakings reviewed pursuant to this PA, FHWA and Mn/DOT shall observe the following requirements:

A. Determination of Undertaking and Assessment of Area of Potential Effect. Pursuant to 36 CFR 800.3 and 800.4, the Mn/DOT Cultural Resource Unit shall (i) determine whether proposed projects, activities, or programs constitute an undertaking; and (ii) establish the undertaking's area of potential effects.

B. Identifying Historic Properties. Pursuant to 36 CFR 800.4, Mn/DOT's Cultural Resources Unit shall identify historic and archaeological properties that may be affected by the undertaking and gather sufficient information to evaluate the eligibility of these properties for the NRHP. Identification of historic and archaeological properties shall follow the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716), and agency programs, including Mn/Model, Mn/DOT's statewide farmstead study, statewide historic bridge study, statewide historic roadside structures study, and others as they are developed, to meet the requirements of Section 110(a)(2) of NHPA.

C. Public Participation and Notification. Mn/DOT shall, through opportunities afforded by the project development process, use existing procedures to solicit public participation early in the project planning process and consistent with 36 CFR 800.3.

D. Evaluating Historic and Archaeological Significance. For any undertaking that may affect properties that have not been previously evaluated for eligibility to the NRHP, Mn/DOT shall apply the National Register Criteria (36 CFR 60.4), and shall make an appropriate finding regarding eligibility pursuant to 36 CFR 800.4(c). Mn/DOT shall notify FHWA and any interested person that this finding has been made and shall make available copies to SHPO of adequate documentation to support that finding for inspection by the public. Prior to any finding of eligibility or non-eligibility, Mn/DOT may consult with SHPO regarding application of the criteria contained in 36 CFR 60.4.

E. Finding of No Historic Properties Affected. If Mn/DOT finds that either there are no historic properties present or there are historic properties present but the undertaking will have no effect on them as defined in 36 CFR 800.16(i), Mn/DOT shall make a formal finding of No Historic Properties Affected.

F. Findings of No Adverse Effect. For any undertaking that includes, within the area of potential effects, listed or eligible properties that will not be adversely affected by the undertaking, as defined by the Criteria of Adverse Effect set forth in 36 CFR 800.5(a), Mn/DOT shall make a formal finding of no adverse effect and specify those conditions, if any, that shall be imposed to secure that finding. FHWA and Mn/DOT shall ensure that specified conditions are met. Mn/DOT shall notify FHWA and any interested person that

transportation projects. It is agreed that the formal supplementary review process described below is intended for use in circumstances of significant disagreement only. For the purpose of informal consultation, the SHPO and OSA may at their discretion, consult via telephone, memo, or in a meeting with Mn/DOT's Cultural Resources Unit. If, for any undertaking, formal written comment or formal written objection, so titled, is made within 30 days by FHWA, Mn/DOT, SHPO, OSA, the Council, or any consulting party, to any findings made by Mn/DOT's Cultural Resources Unit, all parties shall consult, as appropriate. If, after consultation, agreement on federal undertakings cannot be reached regarding any such findings, any party may request the project be reviewed pursuant to the procedures identified in 36 CFR 800.7 with reference only to the subject of the dispute. The responsibility of Mn/DOT, FHWA, SHPO and OSA to carry out all actions under this agreement, other than those that are the subject of the dispute, will remain unchanged.

6. **Dispute Resolution.** Should any party to this agreement object within 30 days to any actions proposed pursuant to this agreement not covered by Section 5 (Supplementary Review), FHWA, Mn/DOT, SHPO, OSA, and the objecting party shall consult to resolve the objection. If the objection cannot be resolved, FHWA and Mn/DOT shall request comment from the Council pursuant to 36 CFR 800.7. FHWA and Mn/DOT in accordance with 36 CFR 800.7(4) will take any Council comment provided in response to such a request into account with reference only to the subject of the dispute. The responsibility of Mn/DOT, FHWA, OSA, and SHPO to carry out all actions under this agreement, other than those that are the subject of the dispute, will remain unchanged.

7. **Amendment.** Any party to this PA may terminate it by providing thirty (30) days written notice to the other parties, provided that the parties will consult during the period before termination to seek agreement on amendments or other action that would avoid termination. In the event of termination, the FHWA shall comply with 36 CFR 800 with regard to the individual undertakings covered by this PA.

8. **Duration.** This PA will be in effect for five years from the date of execution, with renewal upon agreement by all parties.

Execution and implementation of this PA evidences that the FHWA has satisfied its Section 106 responsibilities for all individual undertakings of the Federal-Aid Highway Program in Minnesota.

FEDERAL HIGHWAY ADMINISTRATION

BY: _____ Date: _____
Name and title of signer:

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: _____ Date: _____
Name and title of signer:

MINNESOTA STATE HISTORIC PRESERVATION OFFICER

BY: _____ Date: _____